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515801, AP, India



CERTIFICATE

This is to certify that the Project work entitled "Chemistry of Nucleic Acid" submitted by **D HAZI VALI : 200151001** to S.K.P. Government College, Guntakal, affiliated to Sri Krishnadevaraya University, Ananthapuram for the award of the Bachelor in Science as a part of project work in Semester-VI, is the result of bonafied work carried out by him/her under my guidance and direct supervision. I further certify that this work or part thereof has not been previously formed basis for the award of any Degree, Diploma, Associateship, Fellowship etc., of any other University or Institution.



PRINCIPAL
S.K.P. Govt. Degree College
GUNTAKAL, Ananthapuramu (Dt.)

T. Jithendra
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Dr. T. Jithendra. M.Sc., Ph.D
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CHEMISTRY OF NUCLEIC ACIDS

INTRODUCTION:

Nucleic Acids were discovered by Swiss Scientist-**Joseph Frederick Meischer** in the nuclei of puss cells. The nucleic acids are Phosphorous rich giant molecules present in the nucleus and cause a number of Bio Chemical activities of cell that lead to growth and development of organisms. **Altmann** coined the term 'Nucleic Acid'.

I.COMPONENTS OF NUCLEIC ACIDS: -

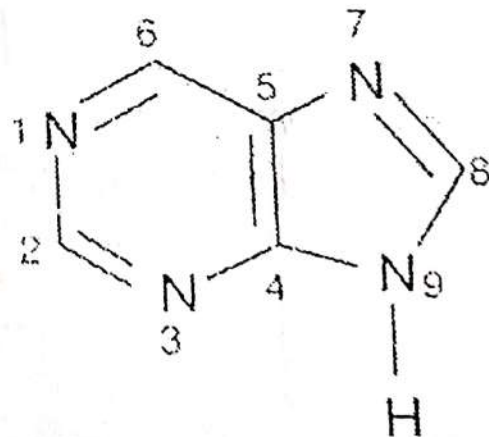
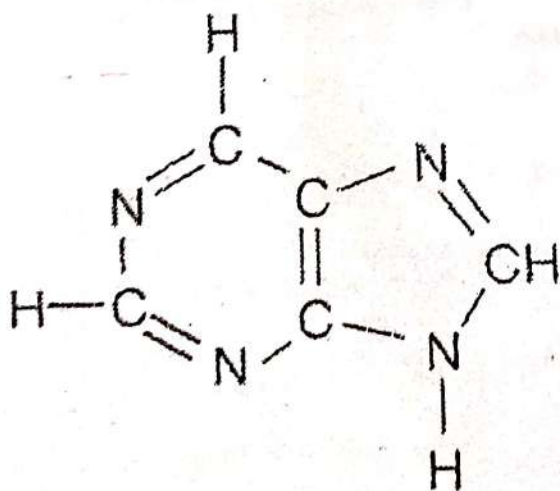
Nucleic acids are the polymers of nucleotides (Polynucleotides) held by 3' and 5' Phosphate bridges. In other words nucleic acids are built up by the monomeric units- nucleotides.

Nucleotides: Nucleotides are composed of nitrogenous base, pentose sugar and a phosphate. The term nucleoside refers to base + sugar, nucleotide is nucleoside + phosphate.

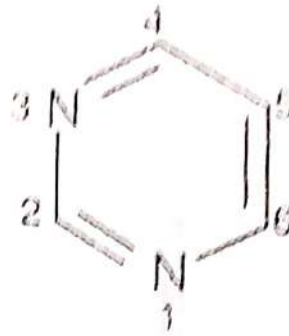
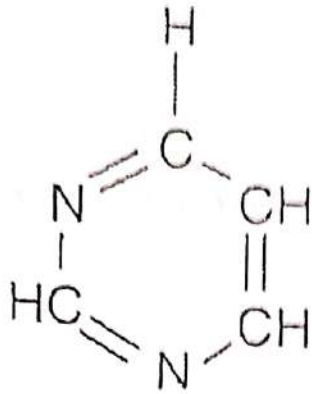
1) Nitrogenous Bases:

The nitrogenous bases found in nucleotides are aromatic heterocyclic compounds. The bases are of two types. They are Purines and Pyrimidines. Their general structures are depicted in below.

General Structure of Purines:

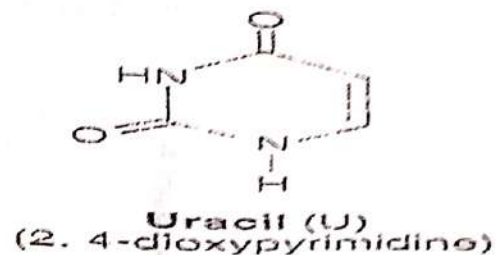
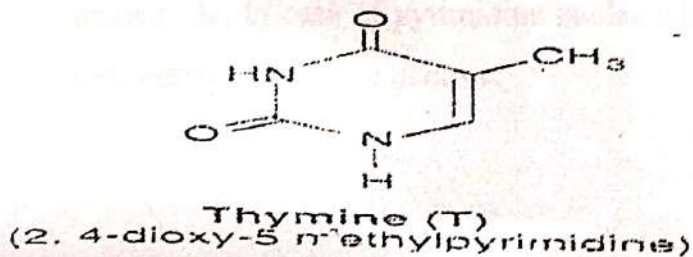
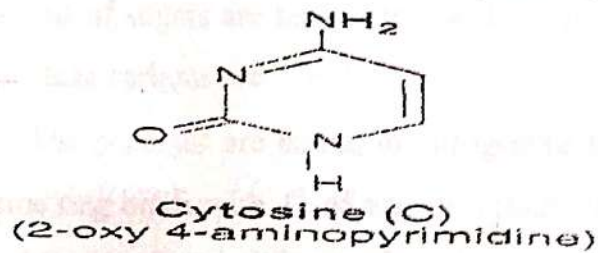
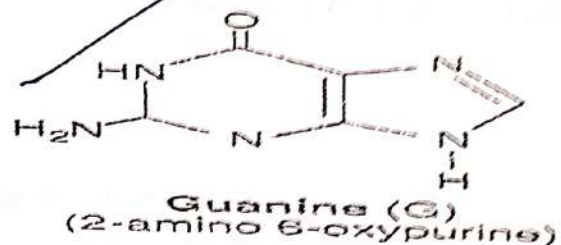
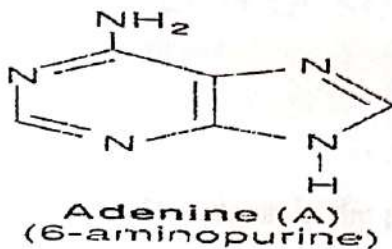


General Structure of Pyrimidines:



Purines are numbered in the anticlockwise direction while pyrimidines are numbered in the clockwise direction. And this is an internationally accepted system to represent the structure of bases.

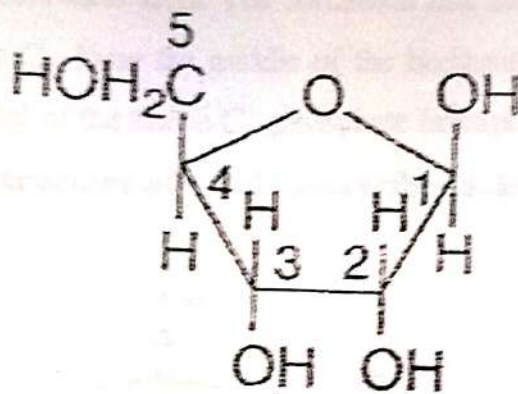
DNA & RNA contains the same purines namely Adenine (A) and Guanine (G). Further, the Pyrimidine Cytosine (C) found in both DNA and RNA. However the nucleic acids differ with respect to the second pyrimidine base. DNA contains Thymine (T) whereas RNA contains Uracil (U). Thymine and Uracil differ in structures by the presence (in T) or absence (in U) of a methyl group. The structures of purines and pyrimidines are shown below.



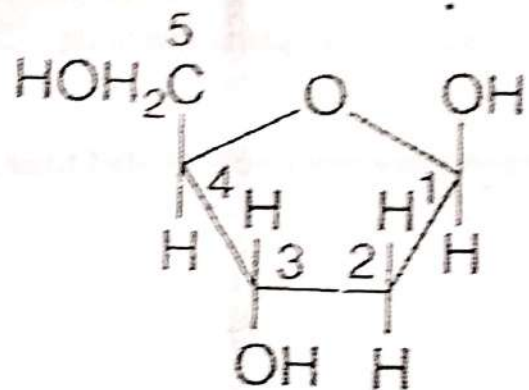
Besides the bases described above, several minor and unusual bases are found in DNA and RNA. These include 5-methyl cytosine, N^6 -acetyl cytosine, N^6 -methyl adenine, N^6 -di-methyl adenine, pseudo uracil etc., It is believed that the unusual bases in nucleic acids will help in the recognition of specific enzymes.

2) Sugars of Nucleic Acids:

The five carbon monosaccharides (pentoses) are found in the nucleic acid structure. RNA contains D-ribose while DNA contains D-deoxyribose. Ribose and Deoxyribose differ in structure at C_2 compared to ribose. The structures of sugars present in nucleic acids are shown below.



D-Ribose



D-2-Deoxyribose

The atoms in the purine ring are numbered as 1 to 9 and for pyrimidine as 1 to 6 the carbons of sugars are represented with an associated prime (1) for differentiation. Those the pentose carbons are 1^1 to 5^1 .

The pentoses are bound to nitrogenous bases by β -N-glycosidic bonds. The N^9 of a purine ring binds with C_1 of a pentose sugar to form a covalent bond in the purine nucleoside. In case of pyrimidine nucleosides, the glycosidic linkage is between N^1 of a pyrimidine and C_1 of a pentose.

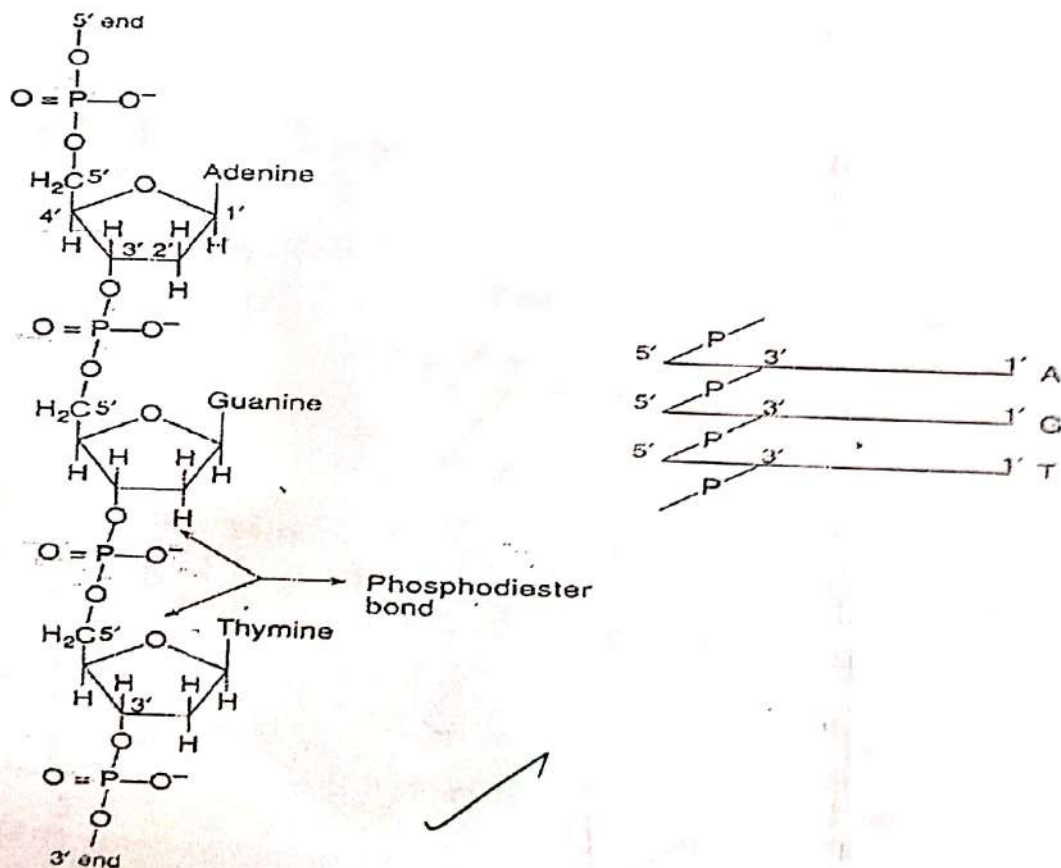
II. TYPES OF NUCLEIC ACIDS:

There are two types of nucleic acids namely deoxyribonucleic acid (DNA) and ribonucleic acid (RNA). Primarily, nucleic acid serves as repositories and transmitters of genetic information.

1. DEOXY RIBONUCLEIC ACID OR DNA: -

DNA is a polymer of deoxyribo nucleotides .It is composed of monomeric units namely deoxy-adenylate (dAmp), deoxy guanylate (dGmp), deoxy cytidylate (dCmp) and deoxy thymidylate (dTmp). This monomeric deoxy nucleotides of DNA are held together by 3¹to5¹ phosphodiester bridges. DNA structure is often represented in a short hand form. The horizontal line indicates the carbon chain of sugar with base attached to C₁. Near the middle of the horizontal line is C₃ , phosphate linkage while at the other end of the line is C₅ ,phosphate linkage.

Structure of a Polydeoxyribonucleotide segment held by Phosphodiester bonds:

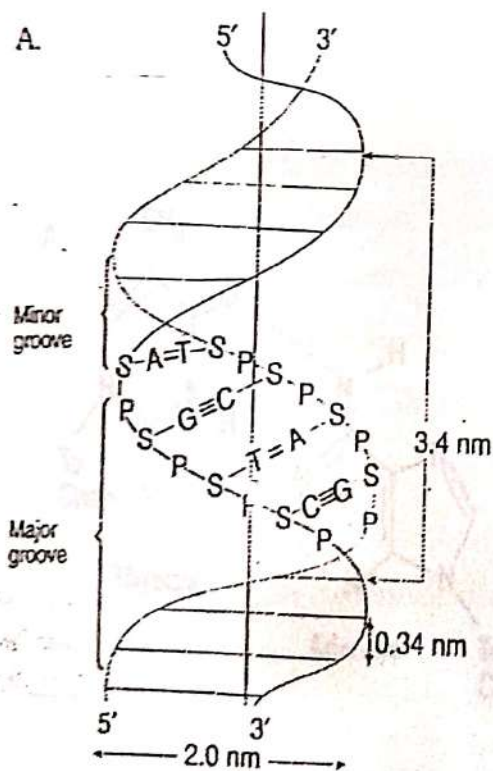


CHARGAFF'S RULE OF DNA COMPOSITION:

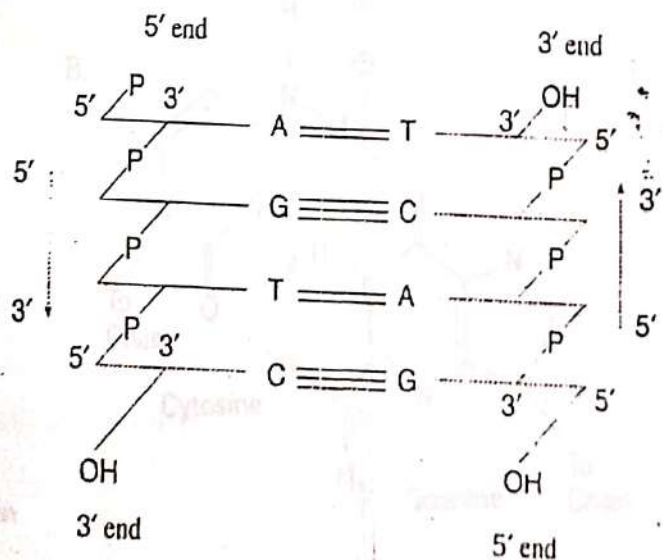
Erwin Chargaff in late 1940's qualitatively analysed the DNA hydrolysates from different species. He observed that in all the species he studied DNA had equal numbers of adenine and thymine residues ($A=T$) and equal numbers of guanine and cytosine residues ($G=C$). This is known as Chargaff's rule of molar equivalence between the purines and pyrimidines in DNA structure. The double helical structure of DNA derives its strength from Chargaff's rule.

THE WATSON AND CRICK MODEL OF DNA STRUCTURE:

The double helical structure of DNA was proposed by James Watson and Francis Crick in 1953. The elucidation of DNA structure is considered as a milestone in the era of modern biology. The structure of DNA double helix is comparable to a twisted ladder. The salient features of Watson-Crick model of DNA are given below.



B.

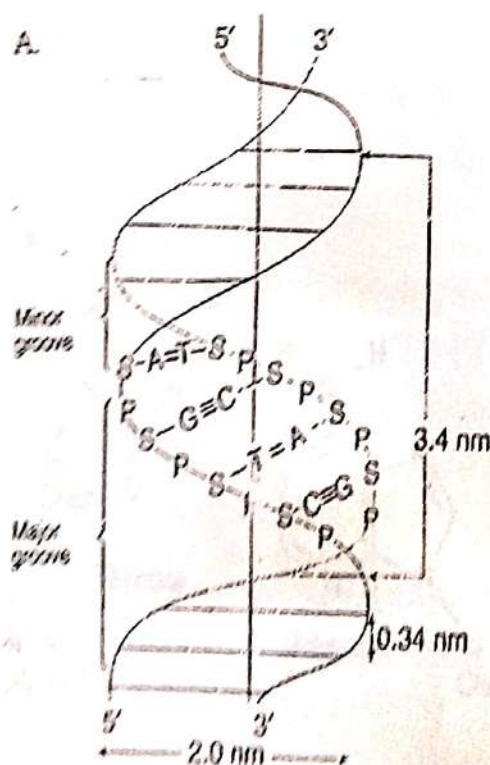


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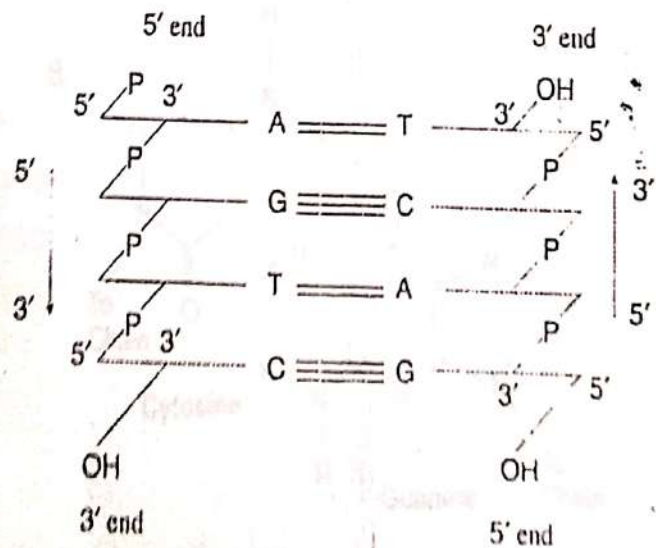
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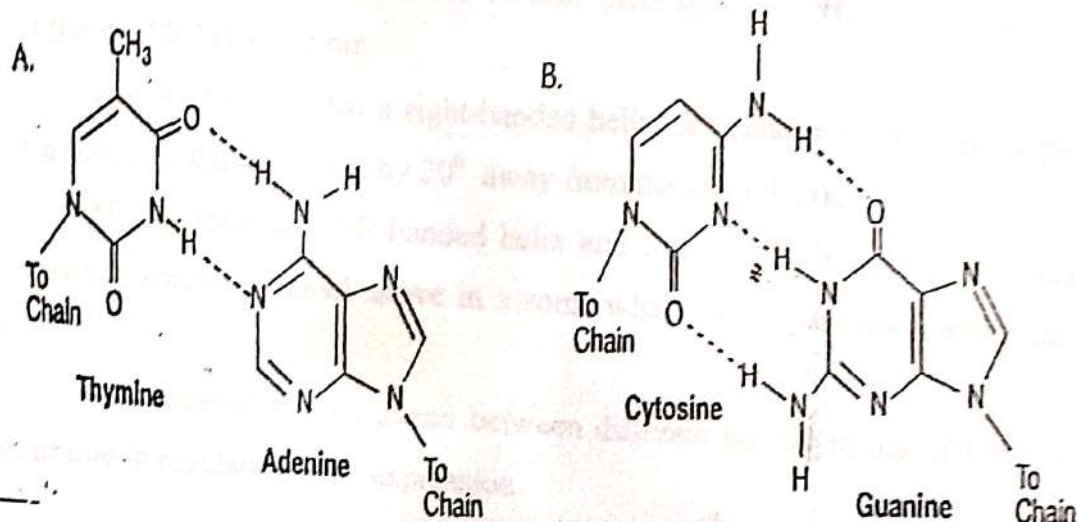


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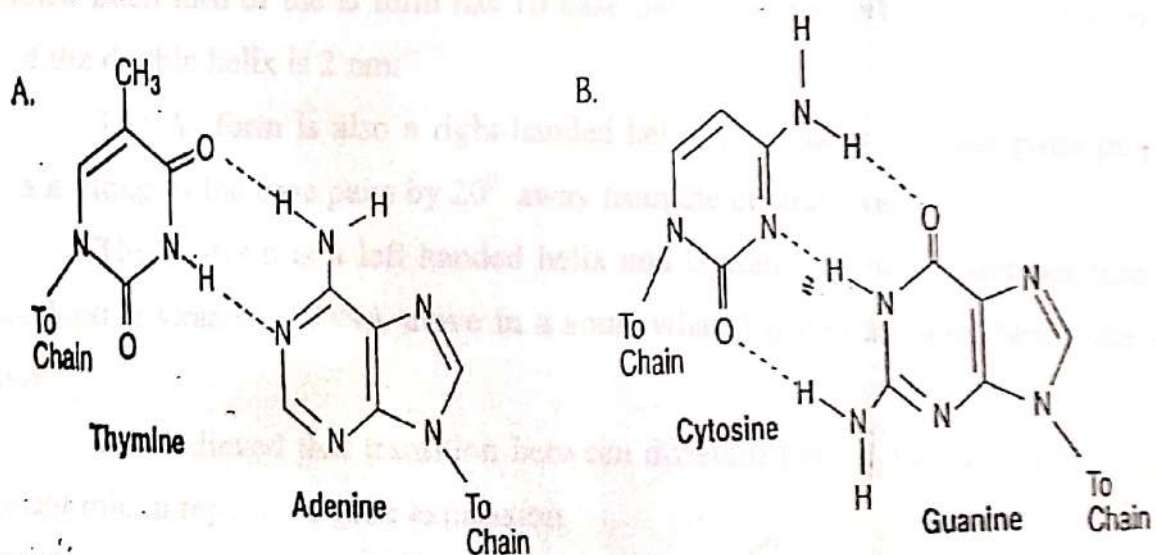
- 1) The DNA is a right-handed double helix. It consists of two polynucleotide chains twisted around each other on a common axis.
- 2) The two strands are antiparallel i.e., are strand runs in the $5' - 3'$ direction. This is comparable to two parallel adjacent roads carrying traffic in opposite direction.
- 3) The width of a double helix is 20 \AA .
- 4) Each turn of the helix is 34 \AA with 10 pairs of nucleotides each pair placed at a distance of about 3.4 \AA .
- 5) Each strand of DNA has a hydrophilic deoxyribose phosphate back bone on the outside of the molecule while the hydrophobic base are stacked inside.
- 6) The two-polynucleotide chains are not identical but complimentary to each other due to base pairing.
- 7) The two strands are held together by hydrogen bonds formed by complimentary base pairs. The A-T pair had 2 hydrogen bonds while G-C pair has 3 hydrogen bonds. The $G \equiv C$ is stronger by above 50% than $A = T$.

COMPLIMENTARY BASE PAIRING IN DNA:



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COMPLIMENTARY BASE PAIRING IN DNA:



- 8) The hydrogen bonds are formed between a purine and pyrimidine only. If two purines face each other, they would not fit into the allowable space. And two pyrimidines would be too far from hydrogen bonds. The only base arrangement possible in DNA structure, from special consideration is A-T, T-A, and G-C & C-G.
- 9) The complimentary base pairing in DNA helix proves Chargaff's rule. The content of adenine equals to that of thymine ($A=T$) and guanine equals to that of cytosine ($G=C$).
- 10) The genetic information resides on one of the two strands known as template strand or sense strand. The opposite strand is antisense strand. The double helix has major grooves along the phosphodiester backbone proteins interact with DNA at these grooves without disrupting the base pairs and double helix.

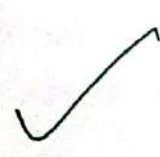
Different forms of DNA double helix:

The double helical structure of DNA exists in at least six different forms A to E and Z. Among these B, A and Z forms are important the B form of DNA double helix described by Watson and Crick is the most pre dominant form under physiological conditions. Each turn of the B form has 10 base pairs spanning a distance of 3.4nm. The width of the double helix is 2 nm.

The A- form is also a right-handed helix. It contains 11 base pairs per turn. There is a tilting of the base pairs by 20° away from the central axis.

The Z -form is a left handed helix and contains 12 base pairs per turn. The poly nucleotide strands of DNA move in a some what Zig-Zag fashion, hence the name Z -DNA.

It is believed that transition between different helical forms of DNA plays a significant role in regulating gene expression.



Organisation of DNA in the cell:

In prokaryotic cells with no distinct nucleus, the DNA is rather loosely packed. In contrast, the eukaryotic DNA is found in association with basic proteins namely histones to form nucleosomes. The nucleosomes in turn coil to produce chromatin in which form DNA is present in the chromosomes.

Five types of histones (H_1 , H_2A , H_2B , H_3 & H_4) occur in combination with DNA. Their categorization is based on the content of Lys/Arg ratio and the amino acid composition of the 5 histones, H_1 is associated with internucleosomes DNA and the rest 4 are the components of nucleosomes. Histones are basic in character and hence can strongly bind with acidic DNA.

SEPARATION OF DNA STRANDS IN THE DOUBLE HELIX:

The two strands of DNA helix are held together by hydrogen bonds. Disruption of hydrogen bonds results in the separation of polynucleotide strands. This phenomenon of loss of helical structure of DNA is known as "denaturation". The phosphodiester bonds are not broken by denaturation. Loss of helical structure can be measured by increase in absorbance at 260nm.

Melting temperature(T_m) is defined as the temperature at which half of the helical structure of DNA is lost. Since G-C base pairs are more stable than A-T base pairs. The T_0 is greater for DNAs with higher G-C content. Thus, the T_0 is 65⁰c for 35% G-C content while it is 70⁰c for 50% G-C content. This chemical compound is effectively used in recombinant DNA experiments.

Functions of DNA:

Although DNA is chiefly concentrated in the chromosomes. It can be found in traces in the chloroplasts and mitochondria. It is the chief genetic material in all organisms except in plant viruses, transduction experiments conducted by Hersley and Chase (1954) confirmed DNA as the genetic material and hence it is referred to as chemical basis of heredity.

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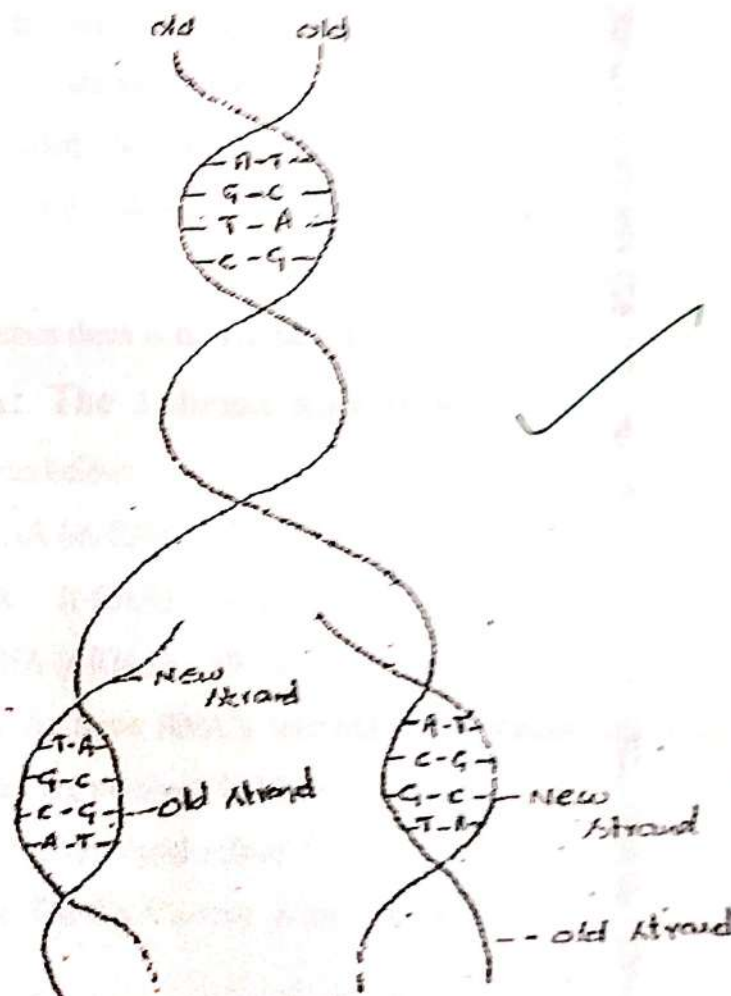
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Mainly the DNA has two functions.

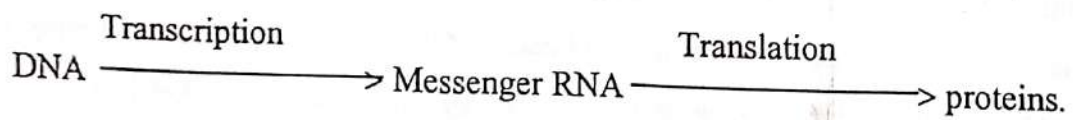
- 1) Autocatalysis
- 2) Heterocatalysis

1) Autocatalysis: The process of duplication of a single DNA molecule into two daughter DNA molecules is called 'autocatalysis' or 'replication'. In this process the two strands of DNA molecule unwind and separate from each other due to the action of endonucleases, which breaks the hydrogen bonds existing between the complementary nitrogen bases. The unwinding starts at one-end proceeds to the other end. Each separated strand acts as a template which synthesis a new strand opposite to the other end. Each separated strand acts as a template which synthesis new strand opposite to the other end with the help DNA polymerize. Thus two daughter strands are formed which are the replicas of one another. Replication of DNA occurs during the 's' subphase of the cell division.



HETEROCATALYSIS:

DNA promotes the synthesis of proteins and regulates various biochemical reactions of cell. In this process the DNA templates transfer called transcription, which helps in the synthesis of proteins.



RIBOSE NUCLEIC ACID: -

RNA is chiefly concentrated in ribosomes and also found in plastids, and mitochondria in traces. It is synthesized inside the nucleus with the help of the enzyme called 'RNA polymerase' but is later released into cytoplasm.

RNA plays an important role in protein synthesis and is non-genetic. However in plant viruses (TMV) it acts as the genetic material.

STRUCTURE OF RNA:

RNA is made-up of a single polynucleotide strand. In reo-virus and wound tumour viruses double standard RNA is present. The nucleotides of RNA composed of three components called phosphate group, ribose sugar ($C_5H_{10}O_5$) and nitrogen bases. The nitrogen bases are Adenine, Guanine, Cytosine and Uracil. Uracil differs from thymine in lacking a methyl (CH_3) group. These nitrogen bases do not show complementarily, hence there is no 1:1 ratio between purines and pyrimidines.

Types of RNA: The 3 distinct types of RNA's with their respective cellular composition are given below.

- 1) Messenger RNA (m-RNA) - 5-10%
- 2) Transfer RNA (t-RNA) - 10-20%
- 3) Ribosomal RNA (r-RNA) - 50-80%

Besides the three RNA's referred above human cells contain small nuclear RNA(S_n RNA) which are involved in RNA processing.

The RNA's are synthesized from DNA and are involved in the process of protein biosynthesis. The RNA's vary in their structure.

1) **Messenger -RNA (m-RNA):** - It was discovered by **Jacob** and **Monod**. It is a straight infolded polynucleotide molecule. Consisting of about few hundred nucleotides. It is synthesized from DNA template chain by a process called 'transcription'. In eukaryotes the m-RNA is synthesized in the nucleus as heterogeneous nuclear RNA (hn RNA). hn RNA on processing liberates the function m-RNA which enter the cytoplasm to participate in protein synthesis. m-RNA has high molecular weight with short half-life.

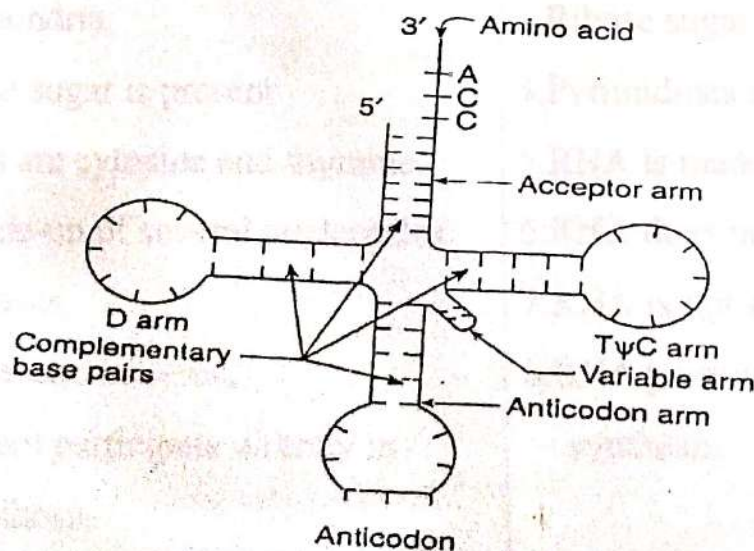
m-RNA is loaded with genetic information required for the synthesis of a specific protein. The genetic message is present in the form of triplet codons. There are 64 codons of which UAA, UAG and UGA are called nonsense codons. The remaining 61 codons code for 21 amino acids.

The eukaryotic m-RNA is capped at the terminal end by 7-methylguanosine triphosphate. It is believed that this cap helps to prevent the hydrolysis of m-RNA by 5¹ - exonucleases. Further the cap may be also involved in the recognition of m-RNA for protein synthesis.

The 3¹ - terminal end of m-RNA contains a polymer of adenylylate residues (20-250 nucleotides) which is known as Poly (A) tail. This tail may provide stability to m-RNA, besides preventing it from the attack of 3¹ - exonucleases.

2. **Transfer RNA (t-RNA):** - Transfer RNA is also known as soluble RNA or adaptor RNA. It contains 71-80 nucleotides with a molecular weight of about 25,000. There are at least 20 species of t-RNA corresponding to 20 amino acids present in protein structure. The structure of t-RNA was first elucidated by **Holley**.

The structure of t-RNA resembles that of a cloverleaf. t-RNA contains mainly four arms, each arm contains a base paired stem.



- a. **The Acceptor arm:** This arm is capped with a sequence CCA (5' to 3'). The amino acid is attached to the acceptor arm.
- b. **The Anticodon arm:** This arm, with the three specific nucleotide bases (anticodon) is responsible for the recognition of triple codon of m-RNA. The codon and anticodon are complementary to each other.
- c. **The D-arm :** It is so named due to the presence of dihydrouridine.
- d. **The T ψ C arm :** This arm contains a sequence of T, pseudouridine and C.
- e. **The variable arm :** This arm is the most variable in t-RNA. Based on this variability t-RNA's are classified into two categories.
 1. **Class -I -t-RNA's:** - The most predominant form with 3-5 base pairs length.
 2. **Class -II- t-RNA:** - They contain 13-20 base pair long arm.

3. RIBOSOMAL RNA (r-RNA) :

The ribosomes are the factories of protein synthesis. They are composed up to major nucleoprotein complexes – 60s sub unit and 40s sub unit. The 60s subunits contain 28s r-RNA, 5s r-RNA and 5.8s r-RNA, while the 40s subunits contains 18s r-RNA. The function of r-RNAs in ribosomes is not clearly known. It is believed that they play a significant role in the binding of m-RNA to ribosomes and protein synthesis.

DIFFERENCES BETWEEN DNA AND RNA	
DNA	RNA
1. Consists of two strands of nucleotides	1. Consists of only one strand of nucleotides.
2. Most of the DNA is present in the nucleus and very little in chloroplasts and mitochondria.	2. Most of the RNA is present in cytoplasm and little in the nucleus.
3. Deoxyribose sugar is present	3. Ribose sugar is present
4. Pyrimidines are cytosine and thymine.	4. Pyrimidines are cytosine and uracil.
5. DNA is made-up of several nucleotides.	5. RNA is made-up of few nucleotides.
6. DNA replicates.	6. RNA does not replicate.
7. DNA is a genetic material.	7. RNA is not a genetic material.
8. DNA does not participate directly in protein synthesis.	8. RNA participates directly in protein synthesis.

Question:

DNA where you observed?

- 1) Better drawn on your own.
- 2) present the model (if possible)
- 3) Add content in your own language.

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CERTIFICATE

This is to certify that the Project work entitled "KINETICS OF HYDROGEN PEROXIDE DECOMPOSITION" submitted by M Upendra : 200151065 to S.K.P. Government College, Guntakal, affiliated to Sri Krishnadevaraya University, Ananthapuram for the award of the Bachelor in Science as a part of project work in Semester-VI, is the result of bonafied work carried out by him/her under my guidance and direct supervision. I further certify that this work or part thereof has not been previously formed basis for the award of any Degree, Diploma, Associateship, Fellowship etc., of any other University or Institution.

PRINCIPAL
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T.Jithendra
Dr. T. Jithendra, M.Sc., Ph.D
(Project Supervisor)
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GUNTAKAL -515 803



പ്രദാനം ചെയ്യുന്നു :-

పెక్టైన్ కేటలైజ్ ప్లాస్ట్ 100 ml కేటలైజ్
 పలాన్ లీమ్ కేటలైజ్. 20 ml H₂O, డ్రాగ్స్, డ్రాగ్స్ లీమ్
 కేటలైజ్. డ్రాగ్స్ నాం పాళీ కేటలైజ్ కేటలైజ్ Stop clock నాం కేటలైజ్
 కేటలైజ్ 100 కేటలైజ్ కేటలైజ్ నాం కేటలైజ్. 10 drops 10 ml.
 Feeds డ్రాగ్స్ కేటలైజ్ కేటలైజ్. కేటలైజ్ ప్లాస్ట్ నాం కేటలైజ్
 నాం కేటలైజ్ కేటలైజ్. 10 నాం కేటలైజ్ డ్రాగ్స్ నాం
 కేటలైజ్ కేటలైజ్ 20 ml డ్రాగ్స్ డ్రాగ్స్ కేటలైజ్
 ప్లాస్ట్ కేటలైజ్ డ్రాగ్స్ కేటలైజ్ 5 ml H₂O, డ్రాగ్స్ కేటలైజ్
 డ్రాగ్స్ కేటలైజ్ డ్రాగ్స్ కేటలైజ్ కేటలైజ్.

ಕೆಳಕಂಡ ವಿವರಗಳಂತೆ ಈ ಪ್ರಯೋಗವನ್ನು ಮಾಡಿ ನೋಡಿ. ಈ
 ಪ್ರಯೋಗವನ್ನು (ಪ್ರಯೋಗಗಳು) 20 ಸಮಯ, 30 ಸಮಯ,
 40 ಸಮಯ, 50 ಸಮಯ, 60 ಸಮಯ ಮತ್ತು 70 ಸಮಯ
 ವರೆಗೆ ಮಾಡಿ. ಈ ಪ್ರಯೋಗದಲ್ಲಿ ಅನಿರೀಕ್ಷಿತವಾಗಿ $KMnO_4$
 ದ್ರವ್ಯವು ಘನವಾಗುವುದನ್ನು ಕಂಡು ಬರುವುದರಲ್ಲಿ V_1 ಎಂಬ
 ಸಮಯ ಇಷ್ಟರಲ್ಲಿ ದ್ರವ್ಯ (ಪ್ರಯೋಗದಲ್ಲಿ) 20 ml H_2O_2
 ದ್ರವ್ಯವನ್ನು ಕೆಳಕಂಡ ಸ್ಥಾನದಲ್ಲಿ ಇರಿಸಿ. ಇದರಲ್ಲಿ ಲೀನಿಸಿಕೊಂಡು 100 ml
 ದ್ರವ್ಯವನ್ನು ಕೆಳಕಂಡ ಸ್ಥಾನದಲ್ಲಿ ಇರಿಸಿ. 20 ml ದ್ರವ್ಯವನ್ನು
 ದ್ರವ್ಯ ಕೆಳಕಂಡ ಸ್ಥಾನದಲ್ಲಿ ಲೀನಿಸಿಕೊಂಡು 5 ml H_2O_4 ತೆಳವಿ (ಪ್ರಯೋಗ)
 $KMnO_4$ ಅನ್ನು ಪ್ರಯೋಗದಲ್ಲಿ ಇರಿಸಿ. $KMnO_4$ ಘನವಾಗುವುದನ್ನು
 V_2 ನು ತಿಳಿಸಿ. ಈ ಎರಡರಲ್ಲಿ (ಪ್ರಯೋಗದಲ್ಲಿ) ದ್ರವ್ಯವನ್ನು
 ಸಮಯದಲ್ಲಿ ದ್ರವ್ಯವನ್ನು K ಎಂಬುದು ತಿಳಿಸಿ. ಈ
 ಎರಡು ಸ್ಥಾನಗಳಲ್ಲಿ ಗಾತ್ರವನ್ನು H_2O_2 ಎಂಬುದನ್ನು (ಪ್ರಯೋಗ)
 (ಪ್ರಯೋಗದಲ್ಲಿ)

TABLE

ಕ್ರ. ಸಂ.	ಸಮಯ (min)	ಪ್ರತಿಕ್ರಿಯೆ (ml)		KMnO ₄ (ml)	$k = \frac{2.303}{t} \log \frac{V_0}{V_0 - V_t}$ (sec ⁻¹)
		ಪ್ರತಿಕ್ರಿಯೆ	ಪ್ರತಿಕ್ರಿಯೆ		
1	0	0	37.5	37.5 (V ₀)	
2	10	0	32.2	32.2	2.5314×10^{-4}
3	20	0	31.6	31.6	1.426×10^{-4}
4	30	0	31.0	31.0	1.0545×10^{-4}
5	40	0	28.7	28.7	1.1125×10^{-4}
6	50	0	27.2	27.2	1.0659×10^{-4}
7	60	0	26.1	26.1	1.00535×10^{-4}


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CERTIFICATE

This is to certify that the Project work entitled **ESTIMATION OF MEFENAMIC ACID PRESENT IN MEFTAL[®]** submitted by **D USENBI : 200151008** to S.K.P. Government College, Guntakal, affiliated to Sri Krishnadevaraya University, Ananthapuram for the award of the Bachelor in Science as a part of project work in Semester-VI, is the result of bonafied work carried out by him/her under my guidance and direct supervision. I further certify that this work or part thereof has not been previously formed basis for the award of any Degree, Diploma, Associateship, Fellowship etc., of any other University or Institution.


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MEFENAMIC ACID

Leading Brands:

MEFTAL (BLUE CROSS)

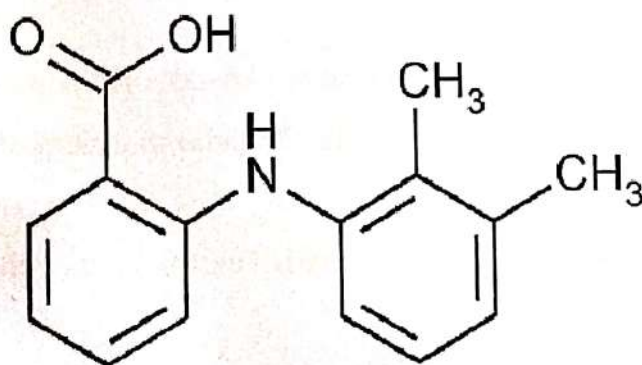
PONTSTAN (PARKE-DAVIS)

Introduction :

Mefenamic acid a nonsteroidal , anti-inflammatory drugs belonging to the groups of fenamates. It has potent analgesic activity as well as anti-inflammatory and antipyretic actions. The fenamates are a family of aspirin-like drugs, and include other members such as flutenamic, meclofenamic and tolfenamic acids in addition to Mefenamic acid. Mefenamic acid is used primarily as analgesic but can be useful in rheumatoid arthritis, osteoarthritis ankylosing spondylitis and other conditions.

Chemistry :

Mefenamic acids is a N-substituted phenylanthranilic acid. Its full chemical name is N (2,3-xylyl) anthranilic acid. The structural formula is given below.



MEFENAMIC ACID

Leading Brands:

MEFAL (BLUE CROSS)

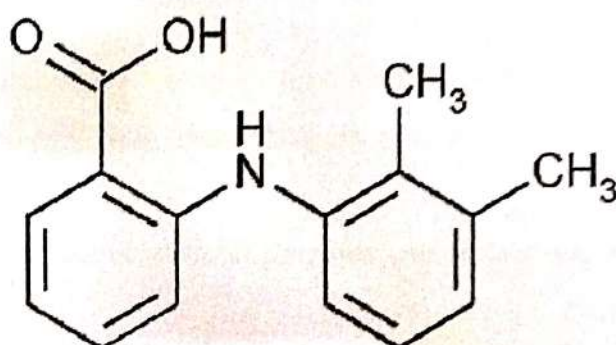
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Chemistry :

Mefenamic acid is a N-substituted phenylanthranilic acid. Its full chemical name is N (2,3-xylol) anthranilic acid. The structural formula is given below.



The position of the two phenyl rings in a perpendicular relationship to each other, appears to confer a slightly different activity profile to the fenamates. Mefenamic acid is a grey or greyish white odorless, tasteless microcrystalline powder with a molecular weight of 241.3.

Caution: An anti-inflammatory drug belongs to the fenamates groups

Action :

Anti-inflammatory action due to inhibition of cyclooxygenase and PG synthesis. Also reduces products of lipo-oxygenase pathway blocks action of PGs at their receptors. Central and peripheral analgesic and antipyretic activity

Pharmacokinetics :

Well absorbed orally. A 1 g dose gives a C_{max} of 10 mg/L in a T_{max} of 2-4 h. steady state in 2-3 days. widely distributed. Enters brain in small amounts. Crosses placenta and is excreted into breast milk in small amounts. Protein binding 99%. Metabolized in liver and excreted in urine and to a lesser extent in faeces. Plasma half life 3-4 hrs.

Indications :

Chronic inflammatory conditions, primary dysmenorrhea, menorrhagia, musculoskeletal conditions, dental, postoperative and post partum pain, migraine.

Dosage :

500mg three times daily, Children: 25mg/kg/day in divided doses.

Contraindications ::

Inflammatory bowel syndrome, peptic ulcer, GI bleeding, hypersensitivity to aspirin or other NSAIDs, renal and hepatic impairment.

Adverse Reactions ::

Mostly gastrointestinal. diarrhea, renal damage, hypersensitivity reactions.

Caution :

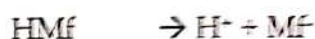
Patients on anticoagulants, history of peptic ulcer, GI bleeding, renal impairment, elderly, pregnancy.

Interactions : Digoxin, lithium diuretics, oral anti-coagulants.

METHODS AND METHODOLOGY

PRINCIPLE

According to Kohlrausch law conductance depends upon the number and mobility of the ions. In this case the Conductometric titration of weak acid and strong base, initial conductance of Mefenamic acid solution (Mefal) (taken in conductivity cell) is low because of its poor dissociation i.e. weak acid gives only low concentration of H^+ ions.



On the addition of NaOH solution highly ionized sodium mefenamate is formed.



The mefenamate ions at first tend to suppress the ionization of Mefenamic acid due to common ion effect but soon the conductivity begins to rise because the conductivity of highly ionized sodium mefenamate exceeds that of weak acid. The conductance goes on increasing with the addition of NaOH solution.

When whole of the acetic acid in the conductivity cell has been neutralized, further addition of NaOH solution increases the conductance sharply because the addition of NaOH introduces the fast moving OH^- ions. When conductance is plotted against the volume of alkali added, two lines intersecting at the point "B" are obtained. the point of intersection "B" corresponds to the end point and hence gives the volume of alkali required for the neutralization of the acid.

After neutralization the resulting solution has OH^- ions which are fast moving than mefenamate ions and Na^+ ion with the result, conductance increases sharply.

CHEMICALS & EQUIPMENT:

Mefenamic acid,	NaOH,	Conductivity cell,
100ml beaker,	Burette,	Glass rod

PROCEDURE:

Take 40 ml of already prepared 0.1M Mefenamic acid in a 100 ml beaker. Now dip the conductivity cell in the beaker just 1 cm below the surface, connect the terminals of the cell to the connectivity bridge and measure the conductance. Now add 0.1M NaOH at a time and stir well with glass rod without taking it out of the beaker. Initially the conductance is less and gradually increases due to formation of mefenamate ions and further addition of NaOH increases the conductance rapidly due to OH^- ions. This is the equivalent point. Now plot a graph between conductance on Y-axis and volume of NaOH on X-axis. Measure the volume of NaOH at complete neutralization point this gives the volume of NaOH required to neutralize Mefenamic acid.

volume?
equiv concn.

RESULT , REPORT AND DISCUSSION :

The conductometric titration of Mefenamic acid with strong base NaOH is a classical titration of moderately strong acid with strong base. Hence the conductometric graph obtained is curved and does not give a definite end point. The salt line is drawn with salt. Testing with phenolphthalein measuring conductance at different concentrations.

The intercept of the tangent is used for determining the exact end point. The normal volumetric calculations are used to determine the concentration of the Mefenamic acid.

Though, precautions are taken in case of cleaning of apparatus, preparation of solutions, standardization processes, and instrumentation calibration, human error, environmental effects might have caused aberration in the result.


REPORT :

THE ORAL FORMULATION , MEFTAL - 500 REGISTERED TRADE MARK/BRAND OF PHARMACEUTICAL COMPANY, BLUE CROSS LABORATORIES LTD (MENTIONED EARLIER) BATCH NO : HK1110 MANUFACTURED ON : 05/12 , EXPIRY DATE : 04/14 , CONTAINS THE DRUG MEFENAMIC ACID AS SPECIFICALLY ENLISTED ON PROFILE AND IS VERIFIED TO BE OF STANDARD FORMULATION WITH GOOD QUALITY.



Comments & Suggestions

1. Experimental observations on calculation to be presented
2. Standardization / calibration need be done for Industrial calc.

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This is to certify that the Project work entitled "Chemistry of Nucleic Acid" submitted by **D HAZI VALI : 200151001** to S.K.P. Government College , Guntakal, affiliated to Sri Krishnadevaraya University, Ananthapuram for the award of the Bachelor in Science as a part of project work in Semester-VI , is the result of bonafied work carried out by him/her under my guidance and direct supervision. I further certify that this work or part thereof has not been previously formed basis for the award of any Degree, Diploma, Associateship, Fellowship etc.,. of any other University or Institution.


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This is to certify that the Project work entitled "Chemistry of Nucleic Acid" submitted by P Nikhil : 200151069 to S.K.P. Government College , Guntakal, affiliated to Sri Krishnadevaraya University, Ananthapuram for the award of the Bachelor in Science as a part of project work in Semester-VI, is the result of bonafied work carried out by him/her under my guidance and direct supervision. I further certify that this work or part thereof has not been previously formed basis for the award of any Degree, Diploma, Associateship, Fellowship etc.,. of any other University or Institution.


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This is to certify that the Project work entitled **"KINETICS OF HYDROGEN PEROXIDE DECOMPOSITION"** submitted by **M Upendra** : **200151065** to S.K.P. Government College , Guntakal, affiliated to Sri Krishnadevaraya University, Ananthapuram for the award of the Bachelor in Science as a part of project work in Semester-VI , is the result of bonafied work carried out by him/her under my guidance and direct supervision. I further certify that this work or part thereof has not been previously formed basis for the award of any Degree, Diploma, Associateship, Fellowship etc., of any other University or Institution.


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This is to certify that the Project work entitled "KINETICS OF HYDROGEN PEROXIDE DECOMPOSITION" submitted by G Rahul dev : 200151062 to S.K.P. Government College , Guntakal, affiliated to Sri Krishnadevaraya University, Ananthapuram for the award of the Bachelor in Science as a part of project work in Semester-VI , is the result of bonafied work carried out by him/her under my guidance and direct supervision. I further certify that this work or part thereof has not been previously formed basis for the award of any Degree, Diploma, Associateship, Fellowship etc.,. of any other University or Institution.


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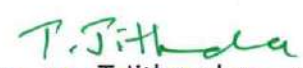


CERTIFICATE

This is to certify that the Project work entitled **ESTIMATION OF MEFENAMIC ACID PRESENT IN MEFTAL** " submitted by **D USENBI** : 200151008 to S.K.P. Government College , Guntakal, affiliated to Sri Krishnadevaraya University, Ananthapuram for the award of the Bachelor in Science as a part of project work in Semester-VI , is the result of bonafied work carried out by him/her under my guidance and direct supervision. I further certify that this work or part thereof has not been previously formed basis for the award of any Degree, Diploma, Associateship, Fellowship etc., of any other University or Institution.


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This is to certify that the Project work entitled ““QUANTITATIVE ESTIMATION OF ACETYLSALICYLIC ACID PRESENT IN DISPRIN” submitted by B GADILINGA : 200151101 to S.K.P. Government College , Guntakal, affiliated to Sri Krishnadevaya University, Ananthapuram for the award of the Bachelor in Science as a part of project work in Semester-VI , is the result of bonafied work carried out by him/her under my guidance and direct supervision. I further certify that this work or part thereof has not been previously formed basis for the award of any Degree, Diploma, Associateship, Fellowship etc.,. of any other University or Institution.


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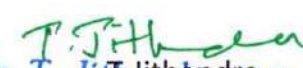


CERTIFICATE

This is to certify that the Project work entitled **"STUDY OF INGREDIENTS PRESENT IN AERATED COOL DRINKS"** submitted by **H INDU : 200151010** to S.K.P. Government College , Guntakal, affiliated to Sri Krishnadevaraya University, Ananthapuram for the award of the Bachelor in Science as a part of project work in Semester-VI , is the result of bonafied work carried out by him/her under my guidance and direct supervision. I further certify that this work or part thereof has not been previously formed basis for the award of any Degree, Diploma, Associateship, Fellowship etc.,. of any other University or Institution.


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CERTIFICATE

This is to certify that the Project work entitled "**COMPARITIVE STUDY OF INGREDIENTS IN COLGATE BRANDS**" submitted by **J VENKANNA : 200151106** to S.K.P. Government College , Guntakal, affiliated to Sri Krishnadevaraya University, Ananthapuram for the award of the Bachelor in Science as a part of project work in Semester-VI , is the result of bonafied work carried out by him/her under my guidance and direct supervision. I further certify that this work or part thereof has not been previously formed basis for the award of any Degree, Diploma, Associateship, Fellowship etc.,. of any other University or Institution.

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CERTIFICATE

This is to certify that the Project work entitled "^aESTIMATION OF CARBONATE (CO_3^{2-}) AND BICARBONATE (HCO_3^{-}) PRESENT IN GIVEN WASHING POWDER SAMPLE" submitted by N LINGARAJU : 200151109 to S.K.P. Government College , Guntakal, affiliated to Sri Krishnadevaraya University, Ananthapuram for the award of the Bachelor in Science as a part of project work in Semester-VI , is the result of bonafied work carried out by him/her under my guidance and direct supervision. I further certify that this work or part thereof has not been previously formed basis for the award of any Degree, Diploma, Associateship, Fellowship etc., of any other University or Institution.


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This is to certify that the Project work entitled **"STUDY OF FOAMING CAPACITY OF SOAPS"** submitted by **M OBULESU : 200151107** to S.K.P. Government College , Guntakal, affiliated to Sri Krishnadevaraya University, Ananthapuram for the award of the Bachelor in Science as a part of project work in Semester-VI , is the result of bonafied work carried out by him/her under my guidance and direct supervision. I further certify that this work or part thereof has not been previously formed basis for the award of any Degree, Diploma, Associateship, Fellowship etc.,. of any other University or Institution.


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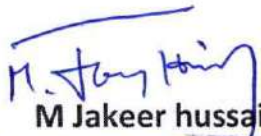
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CERTIFICATE

This is to certify that the Project work entitled **A Study project on chemical Compositions in Home Sensitization Products** submitted by **B Ranga swamy : 200151059** to S.K.P. Government College , Guntakal, affiliated to Sri Krishnadevaraya University, Ananthapuram for the award of the Bachelor in Science as a part of project work in Semester-VI , is the result of bonafied work carried out by him/her under my guidance and direct supervision. I further certify that this work or part thereof has not been previously formed basis for the award of any Degree, Diploma, Associateship, Fellowship etc.,. of any other University or Institution.


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CERTIFICATE

This is to certify that the Project work entitled "**ESTIMATION OF ASPRIN IN DISPIRIN TABLET**" submitted by **J Nagaveni : 200151252** to S.K.P. Government College , Guntakal, affiliated to Sri Krishnadevaraya University, Ananthapuram for the award of the Bachelor in Science as a part of project work in Semester-VI , is the result of bonafied work carried out by him/her under my guidance and direct supervision. I further certify that this work or part thereof has not been previously formed basis for the award of any Degree, Diploma, Associateship, Fellowship etc.,. of any other University or Institution.


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This is to certify that the Project work entitled "**Estimation of Hardness of the Analysis of Guntakal rural area** " submitted by **B Hemavathi : 200151057** to S.K.P. Government College , Guntakal, affiliated to Sri Krishnadevaraya University, Ananthapuram for the award of the Bachelor in Science as a part of project work in Semester-VI , is the result of bonafied work carried out by him/her under my guidance and direct supervision. I further certify that this work or part thereof has not been previously formed basis for the award of any Degree, Diploma, Associateship, Fellowship etc., of any other University or Institution.


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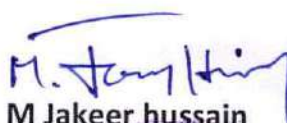


CERTIFICATE

This is to certify that the Project work entitled "**Estimation of Hardness of the Analysis of Guntakal rural area** " submitted by **A Ramesh : 200151056** to S.K.P. Government College , Guntakal, affiliated to Sri Krishnadevaraya University, Ananthapuram for the award of the Bachelor in Science as a part of project work in Semester-VI , is the result of bonafied work carried out by him/her under my guidance and direct supervision. I further certify that this work or part thereof has not been previously formed basis for the award of any Degree, Diploma, Associateship, Fellowship etc.,. of any other University or Institution.


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This is to certify that the Project work entitled "**Water analysis**" submitted by **Y MADHU : 200151263** to S.K.P. Government College , Guntakal, affiliated to Sri Krishnadevaraya University, Ananthapuram for the award of the Bachelor in Science as a part of project work in Semester-VI , is the result of bonafied work carried out by him/her under my guidance and direct supervision. I further certify that this work or part thereof has not been previously formed basis for the award of any Degree, Diploma, Associateship, Fellowship etc., of any other University or Institution.

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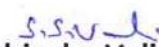


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This is to certify that the Project work entitled "SOIL ANALYSIS" submitted by **P .Ramya : 200151051** to S.K.P. Government College , Guntakal, affiliated to Sri Krishnadevaraya University, Ananthapuram for the award of the Bachelor in Science as a part of project work in Semester-VI , is the result of bonafied work carried out by him/her under my guidance and direct supervision. I further certify that this work or part thereof has not been previously formed basis for the award of any Degree, Diploma, Associateship, Fellowship etc., of any other University or Institution.


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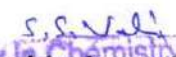


CERTIFICATE

This is to certify that the Project work entitled "COLLECTION OF DATA OF INGREDIENTS PRESENT IN COMMONLY USED HOUSEHOLD PRODUCTS" submitted by T Blessy : 200151262 to S.K.P. Government College , Guntakal, affiliated to Sri Krishnadevaraya University, Ananthapuram for the award of the Bachelor in Science as a part of project work in Semester-VI , is the result of bonafied work carried out by him/her under my guidance and direct supervision. I further certify that this work or part thereof has not been previously formed basis for the award of any Degree, Diploma, Associateship, Fellowship etc., of any other University or Institution.

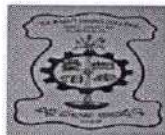

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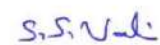


CERTIFICATE

This is to certify that the Project work entitled **"DIABETES – SYMPTOMS, PROGNOSIS, COMPLICATIONS AND TREATMENT"** submitted by I Sree bharath :20151257 to S.K.P. Government College , Guntakal, affiliated to Sri Krishnadevaraya University, Ananthapuram for the award of the Bachelor in Science as a part of project work in Semester-VI , is the result of bonafied work carried out by him/her under my guidance and direct supervision. I further certify that this work or part thereof has not been previously formed basis for the award of any Degree, Diploma, Associateship, Fellowship etc., of any other University or Institution.


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This is to certify that the Project work entitled **"A Study Project On Food Adulteration"** submitted by **D Bharath: 200151061** to S.K.P. Government College, Guntakal, affiliated to Sri Krishnadevaraya University, Ananthapuram for the award of the Bachelor in Science as a part of project work in Semester-VI, is the result of bonafied work carried out by him/her under my guidance and direct supervision. I further certify that this work or part thereof has not been previously formed basis for the award of any Degree, Diploma, Associateship, Fellowship etc., of any other University or Institution.


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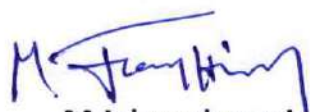
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CERTIFICATE

This is to certify that the Project work entitled "A Study Project on Estimation of acidity in soft drinks "submitted by P Roopa : 200151052 to S.K.P. Government College , Guntakal, affiliated to Sri Krishnadevaraya University, Ananthapuram for the award of the Bachelor in Science as a part of project work in Semester-VI , is the result of bonafied work carried out by him/her under my guidance and direct supervision. I further certify that this work or part thereof has not been previously formed basis for the award of any Degree, Diploma, Associateship, Fellowship etc.,. of any other University or Institution.


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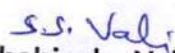


CERTIFICATE

This is to certify that the Project work entitled "CHEMISTRY OF CHLOROPHYLL" submitted by B Haseena : 200151251 to S.K.P. Government College , Guntakal, affiliated to Sri Krishnadevaraya University, Ananthapuram for the award of the Bachelor in Science as a part of project work in Semester-VI , is the result of bonafied work carried out by him/her under my guidance and direct supervision. I further certify that this work or part thereof has not been previously formed basis for the award of any Degree, Diploma, Associateship, Fellowship etc.,. of any other University or Institution.


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CERTIFICATE

This is to certify that the Project work entitled **"A Study Project on Food Adultration "** submitted by **R SURENDRA : 200151112** to S.K.P. Government College , Guntakal, affiliated to Sri Krishnadevaraya University, Ananthapuram for the award of the Bachelor in Science as a part of project work in Semester-VI , is the result of bonafied work carried out by him/her under my guidance and direct supervision. I further certify that this work or part thereof has not been previously formed basis for the award of any Degree, Diploma, Associateship, Fellowship etc.,. of any other University or Institution.


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CERTIFICATE

This is to certify that the Project work entitled " Water Analysis" submitted by **S APSANA : 200151003** to S.K.P. Government College , Guntakal, affiliated to Sri Krishnadevaraya University, Ananthapuram for the award of the Bachelor in Science as a part of project work in Semester-VI , is the result of bonafied work carried out by him/her under my guidance and direct supervision. I further certify that this work or part thereof has not been previously formed basis for the award of any Degree, Diploma, Associateship, Fellowship etc., of any other University or Institution.


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S K P GOVERNMENT DEGREE COLLEGE GUNTAKAL

Ananthapuramu District.

DEPARTMENT OF MATHEMATICS

PROJECT WORK 2020-21



CERTIFICATE

This is to certify that the Project "Integral Transform and Advanced Numerical Analysis" is a bonafide work R. Sai preethi Renuka - III MPCs
190151170 submitted to faculty of Mathematics Department in Partially fulfillment of the requirements for the award of Degree of Bachelor of Science in Mathematics from SKP Govt. Degree College, Guntakal.

Arun
Project Guide

B. Siva prasad
External Examiner

pavani ABL
Head of the Department
Lecturer in Mathematics
S.K.P. Govt. Degree College
Guntakal



[Signature]
PRINCIPAL
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GUNTAKAL, Ananthapuramu (D)

INTRODUCTION ABOUT PIERRE - SIMON LAPLACE



- * NAME :- Pierre Simon Laplace
- * BORN :- 23 March 1749, Beccancourt - en - Auge, Normandy, Kingdom of France.
- * DIED :- 5 March 1827 (aged 77), Paris, France Bourbon France.
- * NATIONALITY :- French
- * ALMA MATER :- University of Caen
- * KNOWN FOR :- Work in celestial Mechanics.
- * KNOWN FOR :- Predicting the Existence of black holes^[1]
Bayesian inference
Bayesian

SCIENTIFIC CAREER

* FIELDS :- Astronomer And Mathematician

* INSTITUTIONS :- Ecole Militaire (1769-1776)

* ACADEMIC :- Jean' Alembert christophe Godbled
ADVISORS pierre Lecanr

* NOTABLE STUDENTS :- Simeon Denis poisson Napoleon Bonaparte
 Laplace formulated Laplace's Equation and pioneered the Laplace Transform with appears in many branches of Mathematical physics, a field that he took a leading role in forming. The Laplacian differential operator widely used in Mathematics is also named after him. He restarted and developed the Nebulosity hypothesis of the origin of the Solar system and was one of the first Scientists to postulate the existence of black holes and the notion of Gravitational collapse. Laplace is remembered as one of the greatest Scientists of all time. Some times referred to as the French Newton or Newton of France. He has been described as possessing a phenomenal natural mathematical faculty superior to any other of his contemporaries during the Bourbon Restoration.

LAPLACE EQUATION

In Mathematics, Laplace's Equation is a Second order partial Differential Equation named after pierre Simon Laplace. who first studied its properties. This is often written as

$$\Delta^2 f = 0 \quad (\text{or}) \quad \Delta f = 0$$

where $\Delta = \nabla \cdot \nabla = \nabla^2$ is the Laplace operator, [note: 1] ∇ is Divergence operator (also symbolized "div"), ∇ is the gradient operator (also symbolized "grad"), and $f(x, y, z)$ is a twice - Differentiable real-valued function. The Laplace operator therefore maps a Scalar function to another Scalar function. If the right-hand side is specified as given function. $h(x, y, z)$, we have

$$\Delta f = h$$

This is called (Poi) Poisson's Equation, a generalization of Laplace and Poisson's Equations are the simplest Examples of elliptic partial Differential Equations.

The Laplace equation is also a Special case of the Helmholtz equation.

SOME PROPERTIES OF LAPLACE TRANSFORMS

Property 1 :- Constant Multiple

If a is a constant and $f(t)$ is a function of t ,
then $L\{af(t)\} = a \cdot L\{f(t)\}$

Ex 1 :- $L\{7 \sin t\} = 7 L\{\sin t\}$

Property 2 :- Linearity Property

If a and b are constants while $f(t)$ and $g(t)$ are functions of t , then

$$L\{a \cdot f(t) + b \cdot g(t)\} = a \cdot L\{f(t)\} + b \cdot L\{g(t)\}$$

Ex 2 :- $L\{3t + 6t^2\} = 3L\{t\} + 6L\{t^2\}$

Property 3 :- Change of Scale Property

If $L\{f(t)\} = F(s)$ then $L\{f(at)\} = \frac{1}{a} F\left(\frac{s}{a}\right)$

Ex 3 :- $L\{f(5t)\} = \frac{1}{5} F\left(\frac{s}{5}\right)$

Property 4 :- Shifting Property

$$L \{ e^{at} f(t) \} = F(s-a)$$

Ex 4 :- $L \{ e^{3t} f(t) \} = F(s-3)$

Property 5 :-

$$L \{ t f(t) \} = -F(s) = \frac{d}{ds} F(s)$$

See the below table for a demonstration of property 5.

Table of Laplace Transformations :

Time Function $f(t)$ $F(s) = L \{ f(t) \}$	Laplace Transform of $f(t)$ $F(s) = L \{ f(t) \}$
1	$\frac{1}{s}$ $s > 0$
t (unit - ramp function)	$\frac{1}{s^2}$ $s > 0$
t^n (n , a positive integer)	$\frac{n!}{s^{n+1}}$ $s > 0$
e^{at}	$\frac{1}{s-a}$ $s > a$
$\sin \omega t$	$\frac{\omega}{s^2 + \omega^2}$ $s > 0$

$\cos \omega t$	$\frac{s}{s^2 + \omega^2}$ $s > 0$
$t^n g(t)$, for $n = 1, 2, \dots$	$(-1)^n \frac{d^n G(s)}{ds^n}$
$t \sin \omega t$	$\frac{2\omega s}{(s^2 + \omega^2)^2}$ $s > \omega $
$t \cos \omega t$	$\frac{s^2 - \omega^2}{(s^2 + \omega^2)^2}$ $s > \omega $
$g(at)$	$\frac{1}{a} G\left(\frac{s}{a}\right)$ Scale property
$e^{at} g(t)$	$G(s-a)$ Shift property
$e^{at} t^n$ for $n = 1, 2, \dots$	$\frac{n!}{(s-a)^{n+1}}$ $s > a$
$t e^{-t}$	$\frac{1}{(s+1)^2}$ $s > -1$
$1 - e^{-t}$	$\frac{1}{s(1+Ts)}$ $s > -\frac{1}{T}$
$e^{at} \sin \omega t$	$\frac{\omega}{(s-a)^2 + \omega^2}$ $s > a$
$e^{at} \cos \omega t$	$\frac{s-a}{(s-a)^2 + \omega^2}$ $s > a$
$u(t)$	$\frac{1}{s}$ $s > 0$
$u(t-a)$	$\frac{e^{-as}}{s}$ $s > 0$
$u(t-a) g(t-a)$	$e^{-as} G(s)$, Time displacement theorem.
$g'(t)$, $g''(t)$	$sG(s) - g(0)$, $s^2 G(s) - sg(0) - g'(0)$
$\int_0^t g(t) dt$	$\frac{G(s)}{s}$
$\int g(t) dt$	$\frac{G(s)}{s} + \frac{1}{s} \int g(t) dt \big _{t=0}$
$g^{(n)}(t)$	$s^n G(s) - s^{n-1}g(0) - \dots - g^{(n-1)}(0)$

PROBLEMS OF LAPLACE TRANSFORM

Solve $L\{(\sin t - \cos t)^3\}$

$$\begin{aligned}
 (\sin t - \cos t)^3 &= \sin^3 t - 3 \sin^2 t \cos t + 3 \sin t \cos^2 t - \cos^3 t \\
 &= \sin^3 t - 3 \cos t + 3 \cos^3 t + 3 \sin t - 3 \sin^3 t \\
 &= 3 \sin t - 3 \cos t - 2 \sin^3 t + 2 \cos^3 t \\
 &= 3 \sin t - 3 \cos t - 2 \frac{1}{4} (3 \sin t - \sin 3t) + 2 \frac{1}{4} (\cos 3t + 3 \cos t)
 \end{aligned}$$

$$\begin{aligned}
 L\{(\sin t - \cos t)^3\} &= 3 \cdot L\{\sin t\} - 3 L\{\cos t\} - \frac{1}{2} 3 L\{\sin t\} + 2 L\{\sin 3t\} \\
 &\quad + \frac{1}{2} L\{\cos 3t\} + \frac{1}{2} 3 L\{\cos t\} \\
 &= 3 \cdot \frac{1}{p^2+1} - \frac{3p}{p^2+1} - \frac{1}{2} 3 \cdot \frac{1}{p^2+1} + \frac{1}{2} \cdot \frac{3}{p^2+9} + \frac{1}{2} \cdot \frac{p}{p^2+9} + \frac{1}{2} \cdot 3 \frac{p}{p^2+1}
 \end{aligned}$$

If $f(t) = \begin{cases} 0, & \text{if } 0 < t < 1 \\ t, & \text{if } 1 < t < 2 \\ 0, & \text{if } t > 2 \end{cases}$ Find $L\{f(t)\}$

Given $f(t) = \begin{cases} 0, & \text{if } 0 < t < 1 \\ t, & \text{if } 1 < t < 2 \\ 0, & \text{if } t > 2 \end{cases}$

$$L\{f(t)\} = \int_0^{\infty} e^{-pt} f(t) dt$$

$$= \int_0^1 e^{-pt} f(t) dt + \int_1^2 e^{-pt} f(t) dt + \int_2^{\infty} e^{-pt} f(t) dt$$

$$= \int_0^1 0 dt + \int_1^2 e^{-pt} t \cdot dt + \int_2^{\infty} 0 \cdot dt$$

$$= \int_1^2 t e^{-pt} dt$$

Applying \pm LATE, $u=t$, $v=e^{-pt}$, $u'=1$, $\int v dt = \frac{e^{-pt}}{p}$

$$\int u v dt = u \int v dt - \int [u' \int v dt] dt$$

$$= \left[\frac{t e^{-pt}}{-p} - \int \frac{1 \cdot e^{-pt}}{-p} dt \right]_1^2$$

$$= \left[\frac{t e^{-pt}}{-p} - \frac{e^{-pt}}{p^2} \right]_1^2 = - \left[\frac{t e^{-pt}}{p} + \frac{e^{-pt}}{p^2} \right]_1^2 = 1$$

$$= - \left[\frac{2 e^{-2p}}{p} + \frac{e^{-2p}}{p^2} - \frac{e^{-p}}{p} - \frac{e^{-p}}{p^2} \right]$$

CHANGE Of SCALE PROPERTY

Statement :-

IF $L\{f(t)\} = f(p)$ then $L\{f(at)\} = \frac{1}{a} f\left(\frac{p}{a}\right)$

Proof :- $L\{f(t)\} = \int_0^{\infty} e^{-pt} f(t) dt = f(p) \longrightarrow \textcircled{1}$

$$L\{f(at)\} = \int_0^{\infty} e^{-pt} f(at) dt$$

put $at = u \Rightarrow a dt = du \Rightarrow dt = \frac{1}{a} du$

As $t \rightarrow 0 \Rightarrow u \rightarrow 0, t \rightarrow \infty \Rightarrow u \rightarrow \infty$

$$L\{f(at)\} = \int_0^{\infty} e^{-p\left(\frac{u}{a}\right)} f(u) \frac{du}{a}$$

$$= \frac{1}{a} \int_0^{\infty} e^{-\left(\frac{p}{a}\right)u} f(u) du$$

$$= \frac{1}{a} f\left(\frac{p}{a}\right) \quad [\text{from } \textcircled{1}]$$

LAPLACE TRANSFORM OF DERIVATIVES

Statement :- IF $L\{f(t)\} = f(p)$ then

$$(i) L\{f'(t)\} = p \cdot f(p) - f(0)$$

$$(ii) L\{f''(t)\} = p^2 f(p) - p f(0) - f'(0)$$

Proof :-

$$\text{Given } L\{f(t)\} = \int_0^{\infty} e^{-pt} f(t) dt = f(p) \longrightarrow \textcircled{1}$$

$$L\{f'(t)\} = \int_0^{\infty} e^{-pt} f'(t) dt = \int_0^{\infty} e^{-pt} d(f(t))$$

$$\int u dv = uv - \int v du$$

$$= \left[e^{-pt} f(t) - \int (-p e^{-pt}) f(t) dt \right]_0^{\infty}$$

$$= \left[e^{-pt} f(t) \right]_0^{\infty} + p \int_0^{\infty} e^{-pt} f(t) dt$$

$$= e^{-\infty} \cdot f(\infty) - e^{0t} f(0) + p f(p) \quad [\text{From } \textcircled{1}]$$

$$= 0 - f(0) + p \cdot f(p)$$

$$= p f(p) - f(0)$$

INITIAL VALUE THEOREM

Statement :- IF $f(t)$ is piecewise continuous for all $t \geq 0$ and of exponential order as $t \rightarrow 0$ then $t \rightarrow 0 \quad f(t) = p^{lt} \rightarrow \infty \quad pL\{f(t)\} = p^{lt} \rightarrow \infty [pF(p)]$.

Proof :- By the theorem of Laplace Transform of Derivatives.

$$L\{f'(t)\} = p \cdot L\{f(t)\} - f(0) \quad \text{and since}$$

$$L\{f'(t)\} = \int_0^{\infty} e^{-pt} f'(t) dt$$

$$\int_0^{\infty} e^{-pt} f'(t) dt = p \cdot L\{f(t)\} - f(0)$$

Applying $p^{lt} \rightarrow \infty$ on both sides

$$p^{lt} \rightarrow \infty \int_0^{\infty} e^{-pt} f'(t) dt = p^{lt} \rightarrow \infty pL\{f(t)\} - p^{lt} \rightarrow \infty f(0)$$

$$\Rightarrow \int_0^{\infty} e^{-\infty} f'(t) dt = p^{lt} \rightarrow \infty pL\{f(t)\} - p^{lt} \rightarrow \infty f(0)$$

$$\Rightarrow 0 = p^{lt} \rightarrow \infty pL\{f(t)\} - p^{lt} \rightarrow \infty f(0)$$

$$\text{and since } f(0) = t \xrightarrow{lt} 0 f(t)$$

$$\Rightarrow 0 = p \xrightarrow{Lt} \infty \quad pL\{f(t)\} - t \xrightarrow{Lt} 0 \quad f(t)$$

$$\Rightarrow t \xrightarrow{Lt} 0 \quad f(t) = p \xrightarrow{Lt} \infty \quad p.L\{f(t)\}$$

$$\Rightarrow p \xrightarrow{Lt} \infty \quad p f(p) \quad [\because L(f(t)) = f(p)]$$

$$[f(t)]_{t=0}^{\infty} = f - \{f(t)\}_{t=0}^{\infty} = f - (f)_{t=0}^{\infty}$$

$$[f(t)]_{t=0}^{\infty} = f - \{f(t)\}_{t=0}^{\infty} = f - (f)_{t=0}^{\infty}$$

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$$[f(t)]_{t=0}^{\infty} = f - \{f(t)\}_{t=0}^{\infty} = f - (f)_{t=0}^{\infty}$$

FINAL VALUE THEOREM

Statement :- If $f(t)$ is a continuous for all $t \geq 0$ and of exponential order as $t \rightarrow \infty$ then

$$\lim_{t \rightarrow \infty} f(t) = \lim_{p \rightarrow 0} p \cdot L\{f(t)\} = p \lim_{p \rightarrow 0} [pF(p)]$$

Proof :- By the theorem of Laplace Transform of derivatives.

$$L\{f'(t)\} = p \cdot L\{f(t)\} - f(0) \text{ and since}$$

$$L\{f'(t)\} = \int_0^{\infty} e^{-pt} f'(t) dt$$

$$\Rightarrow \int_0^{\infty} e^{-pt} f'(t) dt = p \cdot L\{f(t)\} - f(0)$$

Applying $p \rightarrow 0$ on both sides

$$\lim_{p \rightarrow 0} \int_0^{\infty} e^{-pt} f'(t) dt = \lim_{p \rightarrow 0} p \cdot L\{f(t)\} - \lim_{p \rightarrow 0} f(0)$$

$$\Rightarrow \int_0^{\infty} e^0 f'(t) dt = \lim_{p \rightarrow 0} p \cdot L\{f(t)\} - f(0)$$

$$\Rightarrow \int_0^{\infty} f'(t) dt = \lim_{p \rightarrow 0} p \cdot L\{f(t)\} - f(0)$$

$$[f(t)]_0^{\infty} = \lim_{p \rightarrow 0} p \cdot L\{f(t)\} - f(0)$$

$$\Rightarrow 1 \xrightarrow{u} \infty f(u) - f(v) = p \xrightarrow{u} 0 p \in \{f(u)\} - f(v)$$

$$\Rightarrow 1 \xrightarrow{u} \infty f(u) = p \xrightarrow{u} 0 p \in \{f(u)\}$$

$$= p \xrightarrow{u} 0 p \in \{p\}$$

TRANSFORM Of AN INTEGRAL

$$1) \quad L \left\{ \int_0^{\infty} f(t) dt \right\} = \frac{1}{p} L \{ f(t) \} = \frac{1}{p} f(p)$$

$$\text{where } L \{ f(t) \} = f(p)$$

$$2) \quad L \left\{ \int_0^t \int_0^t f(t) dt \right\} = \frac{1}{p^2} f(p)$$

Find Laplace Transform of $\int_0^t e^t \cos t dt$.

$$\text{Since } L \{ \cos t \} = \frac{p}{p^2 + 1}$$

By first shifting theorem :

$$L \{ e^t \cos t \} = \left[\frac{p}{p^2 + 1} \right]_{p \rightarrow p+1}$$

$$= \left[\frac{p+1}{(p+1)^2 + 1} \right] = f(p) \text{ (say)}$$

By Transform of Integral

$$L \left\{ \int_0^t e^t \cos t dt \right\} = \frac{1}{p} f(p)$$

$$= \frac{1}{p} \left[\frac{p+1}{p^2 + 2p + 2} \right]$$

LAPLACE TRANSFORM Of INFINITE INTEGRAL

$$\int_0^{\infty} e^{-pt} f(t) dt = L\{f(t)\} = f(p)$$

Find $\int_0^{\infty} e^{-t} t^3 \sin t dt$

Since $L[\sin t] = \frac{1}{p^2+1}$

$$L\{t \sin t\} = -\frac{d}{dp} \left[\frac{1}{p^2+1} \right] = - \left[\frac{1}{(p^2+1)^2} (2p) \right] = \left[\frac{2p}{(p^2+1)^2} \right]$$

$$L\{t^2 \sin t\} = -\frac{d}{dp} \left[\frac{2p}{(p^2+1)^2} \right]$$

$$= - \left[\frac{(p^2+1)^2 (2) - 2p \cdot 2(p^2+1)(2p)}{(p^2+1)^4} \right]$$

$$= \left[\frac{2-6p^2}{(p^2+1)^3} \right]$$

$$= \frac{2(3p^2-1)}{(p^2+1)^3}$$

$$L\{t^3 \sin t\} = -2 \frac{d}{dp} \left[\frac{3p^2-1}{(p^2+1)^3} \right]$$

$$= -2 \left[\frac{(p^2+1)^3 (6p) - (3p^2-1) 3(p^2+1)^2 (2p)}{(p^2+1)^6} \right]$$

$$= -2(p^2+1)^2 \left[\frac{(p^2+1)6p - (3p^2-1)(6p)}{(p^2+1)^4} \right]$$

$$= \frac{-2}{(p^2+1)^2} (6p) [p^2+1 - 3p^2+1]$$

$$= \frac{-12p(2-2p^2)}{(p^2+1)^4}$$

$$= \frac{24p(p^2-1)}{(p^2+1)^4}$$

$$\int_0^{\infty} t^3 e^t \sin t = L\{t^3 \sin t\}, p=1$$

$$= \frac{24p(p^2-1)}{(p^2+1)^4}$$

$$= \frac{24(1-1)}{(1+1)^4} = 0$$

INVERSE LAPLACE TRANSFORMS

Definition :- If $L\{f(t)\} = F(p)$

$$\Rightarrow \mathcal{L}^{-1}\{F(p)\} = f(t)$$

Example :- $L\{e^t\} = \frac{1}{p-1} \Rightarrow \mathcal{L}^{-1}\left\{\frac{1}{p-1}\right\} = e^t$

$$L\{e^{-at}\} = \frac{1}{p+a} \Rightarrow \mathcal{L}^{-1}\left\{\frac{1}{p+a}\right\} = e^{-at}$$

INVERSE FIRST SHIFTING THEOREM

Statement :- IF $L\{f(t)\} = f(p)$ then

$$(i) \quad L^{-1}\{f(p+a)\} = e^{-at} L^{-1}\{f(p)\}$$

$$(ii) \quad L^{-1}\{f(p-a)\} = e^{at} L^{-1}\{f(p)\}$$

Proof :- Let $L\{f(t)\} = f(p) \Rightarrow L^{-1}\{f(p)\} = f(t)$

By first shifting theorem on Laplace Transform we have

$$L\{e^{-at} f(t)\} = f(p+a), \quad L\{e^{at} f(t)\} = f(p-a)$$

$$\Rightarrow L^{-1}\{f(p+a)\} = e^{-at} f(t) = e^{-at} L^{-1}\{f(p)\}$$

$$L^{-1}\{f(p-a)\} = e^{at} f(t) = e^{at} L^{-1}\{f(p)\}$$

SECOND SHIFTING THEOREM

Statement :- IF $L\{f(t)\} = f(p) \Rightarrow L^{-1}\{e^{-ap} f(p)\} = G(t)$, where

$$G(t) = \begin{cases} f(t-a), & \text{if } t > a \\ 0, & \text{if } t < a \end{cases}$$

Proof :- Let $L\{f(t)\} = f(p)$, $G(t) = \begin{cases} f(t-a), & \text{if } t > a \\ 0, & \text{if } t < a \end{cases}$

By Second shifting Theorem

$$\mathcal{L}\{G(t)\} = e^{-ap} \cdot F(p)$$

$$\mathcal{L}^{-1}\{e^{-ap} F(p)\} = G(t)$$

CHANGE OF SCALE PROPERTY

Statement :- IF $\mathcal{L}\{F(t)\} = F(p)$ then $\mathcal{L}^{-1}\{f(ap)\} = \frac{1}{a} f\left(\frac{p}{a}\right)$

Proof :- Let $\mathcal{L}\{F(t)\} = f(p)$

By change of Scale property

$$\mathcal{L}\{f(at)\} = \frac{1}{a} f\left(\frac{p}{a}\right) \text{ and}$$

$$\mathcal{L}\left\{f\left(\frac{1}{a}\right)\right\} = af(ap)$$

$$\mathcal{L}^{-1}\{af(ap)\} = f\left(\frac{t}{a}\right)$$

$$\mathcal{L}^{-1}\{f(ap)\} = \frac{1}{a} f\left(\frac{t}{a}\right).$$

CONVOLUTION THEOREM

Statement :- IF $f_1(p)$, $f_2(p)$ are Laplace Transforms of $f_1(t)$, $f_2(t)$ respectively the Laplace Transform of $\int_0^t f_1(y) f_2(t-y) dy$ is $f_1(p) \cdot f_2(p)$.

Proof :- $L\{f_1(t)\} = f_1(p) = \int_0^\infty e^{-pt} f_1(t) dt$ — (1)

$L\{f_2(t)\} = f_2(p) = \int_0^\infty e^{-pt} f_2(t) dt$ — (2)

Let $F(t) = \int_0^t f_1(y) f_2(t-y) dy$

$L\{F(t)\} = \int_0^\infty e^{-pt} F(t) dt$

$= \int_0^\infty e^{-pt} \left[\int_0^t f_1(y) f_2(t-y) dy \right] dt$

$= \int_0^\infty \int_0^t f_1(y) f_2(t-y) dy dt$

$= \int_{t=0}^\infty \int_{y=0}^\infty e^{-pt} f_1(y) f_2(t-y) dy dt$

By changing order of Integration.

$$= \int_{y=0}^{\infty} \int_{t=y}^{\infty} e^{-pt} f_1(y) f_2(t-y) dt dy$$

$$= \int_{y=0}^{\infty} f_1(y) \left[\int_{t=y}^{\infty} e^{-pt} f_2(t-y) dt \right] dy$$

$$L\{f(t)\} = \int_{y=0}^{\infty} f_1(y) \left[\int_{x=0}^{\infty} e^{-p(x+y)} f_2(x) dx \right] dy$$

$$= \int_{y=0}^{\infty} \left[f_1(y) e^{-py} \cdot \int_{x=0}^{\infty} e^{-px} f_2(x) dx \right] dy$$

$$= \int_{y=0}^{\infty} e^{-py} f_1(y) \cdot f_2(p) dy$$

$$= f_2(p) \int_{y=0}^{\infty} e^{-py} f_1(y) dy$$

$$= f_2(p) f_1(p) \quad (\because \text{From } \textcircled{1})$$

$$= f_1(p) f_2(p)$$

$$\left[\begin{array}{l} \text{put } t-y = x \\ dt = dx \\ \text{At } t=y \Rightarrow x=0 \\ t=\infty \Rightarrow x=\infty \end{array} \right]$$

HEAVISIDES EXPANSION THEOREM

Statement :- $f(p)$, $G(p)$ are two polynomials in p . $f(p)$ has degree less than $G(p)$. IF $G(p)$ has n distinct roots $\alpha_1, \alpha_2, \dots, \alpha_n$ i.e., $G(p) = (p-\alpha_1)(p-\alpha_2)\dots(p-\alpha_n)$

then
$$\mathcal{L}^{-1} \left\{ \frac{f(p)}{G(p)} \right\} = \int_{n=1}^{\infty} \frac{dr}{G'(\alpha_1)} \cdot e^{\alpha_1 r t}$$

Proof :- Let
$$\frac{f(p)}{G(p)} = \frac{A_1}{p-\alpha_1} + \frac{A_2}{p-\alpha_2} + \dots + \frac{A_n}{p-\alpha_n}$$

Multiplying by $(p-\alpha_1)$ on both sides and applying $p \xrightarrow{L} \alpha_1$ on both sides.

$$\begin{aligned} \Rightarrow A_1 &= p \xrightarrow{L} \alpha_1 \frac{f(p)(p-\alpha_1)}{G(p)} \\ &= f(\alpha_1) p \xrightarrow{L} \alpha_1 \frac{p-\alpha_1}{G(p)} \Rightarrow f(\alpha_1) = \frac{0}{0} \end{aligned}$$

By Hospital rule,

$$A_1 = f(\alpha_1) = p \xrightarrow{L} \alpha_1 \cdot \frac{1}{G'(p)} \Rightarrow A_1 = \frac{f(\alpha_1)}{G'(\alpha_1)}$$

Similarly i on both sides.

$$\mathbb{E} \left\{ \frac{f(p)}{G(p)} \right\} = \sum_{r=1}^n \frac{f(\alpha_r)}{G(\alpha_r)} \cdot \pi$$

$$= \mathbb{E} \left\{ \frac{1}{p - \alpha_1} \right\}$$

$$= \sum_{r=1}^n \frac{f(\alpha_r)}{G(\alpha_r)} \cdot \pi$$

$$\text{for } \pi = \frac{1}{n} \text{ we get } \mathbb{E} \left\{ \frac{1}{p - \alpha_1} \right\} = \frac{1}{n} \sum_{r=1}^n \frac{f(\alpha_r)}{G(\alpha_r)}$$

$$\mathbb{E} \left\{ \frac{1}{p - \alpha_1} \right\} = \frac{1}{n} \sum_{r=1}^n \frac{f(\alpha_r)}{G(\alpha_r)}$$

$$\mathbb{E} \left\{ \frac{1}{p - \alpha_1} \right\} = \frac{1}{n} \sum_{r=1}^n \frac{f(\alpha_r)}{G(\alpha_r)}$$

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$$\mathbb{E} \left\{ \frac{1}{p - \alpha_1} \right\} = \frac{1}{n} \sum_{r=1}^n \frac{f(\alpha_r)}{G(\alpha_r)}$$

$$\mathbb{E} \left\{ \frac{1}{p - \alpha_1} \right\} = \frac{1}{n} \sum_{r=1}^n \frac{f(\alpha_r)}{G(\alpha_r)}$$

PROJECT WORK

ON

ADVANCED NUMERICAL

ANALYSIS

DIED :- 31st March 1727 (aged 84) [o.s 20 March 1726]

RESTING PLACE :- West Minister Abbey

NATIONALITY :- English

ALMA MATER :- Trinity College, Cambridge

AWARDS :- FRS (1672)⁽¹⁾, knight Bachelor (1705)

INSTITUTION :- University of Cambridge Royal society,
Royal Mint.

ACADEMIC ADVISORS :- Isaac Barrow (B), Benjamin Pulleyn (H)(S)

NOTABLE STUDENTS :- Roger Cotes, William Whiston.

Isaac Newton by Isaac Newton

Isaac Newton principles : vol 1 : "The system of the world" : Newton's philosophy of nature : a selection from his writings principles : "The method of fluxions" : "Mathematical principles of natural philosophy" : a treatise on motion : Newton's Principia and Newton's Optics" (page)

Isaac Newton's Law of Gravity

Before Newton people thought that only objects on the earth would fall down. But Newton thought that gravity should not just be limited to the earth, and he argued on it. The reason is that he saw that around the earth by the fact of Earth's gravity. The formula derived by Newton is called "Law of Gravitation".

History Of Isaac Newton

Born in 1643 in Woolsthorpe, England, Sir Isaac Newton began developing his influential theories on light, calculus and celestial mechanics while on breaks from Cambridge university years of research culminated with the 1687 publication of "principia", a landmark work that established the universal law of motion and gravity newton's second major book, "opticks", detailed his experiments to determine the properties of light also a student of the "Royal Society" of "London" and master of England's Royal mint "until his death in 1727".

FORWARD DIFFERENCES

If $y_0, y_1, y_2, \dots, y_n$ are the values of y then

$y_1 - y_0, y_2 - y_1, \dots, y_n - y_{n-1}$ are called forward

differences they are denoted by

$\Delta y_0, \Delta y_1, \Delta y_2, \dots, \Delta y_{n-1}$ i.e., $\Delta y_0 = y_1 - y_0$

$$\Delta y_1 = y_2 - y_1$$

$$\Delta y_2 = y_3 - y_2$$

$$\Delta y_n = y_n - y_{n-1}$$

Here Δ is called the forward difference operator and $\Delta^2 y_0, \Delta^2 y_1, \dots$ are called second ordered forward Difference.

FORWARD DIFFERENCE TABLE :

x	y	Δ	Δ^2	Δ^3	Δ^4
x_0	y_0	Δy_0			
x_1	y_1	Δy_1	$\Delta^2 y_0$	$\Delta^3 y_0$	
x_2	y_2	Δy_2	$\Delta^2 y_1$	$\Delta^3 y_1$	$\Delta^4 y_0$
x_3	y_3	Δy_3	$\Delta^2 y_2$		
x_4	y_4				

BACKWARD DIFFERENCE

If $y_0, y_1, y_2, \dots, y_n$ are the values of $y = f(x)$ then $y_1 - y_0, y_2 - y_1, y_n - y_{n-1}$ are called Backward Differences they are denoted by

$$\Delta y_1, \Delta y_2, \Delta y_3, \dots, \Delta y_n$$

$$\Delta y_1 = y_1 - y_0, \Delta y_2 = y_2 - y_1, \Delta y_3 = y_3 - y_2$$

$$\therefore \Delta y_n = y_n - y_{n-1}$$

Here Δ is called Backward Difference operator $\Delta^2 y_1, \Delta^2 y_2, \dots, \Delta^2 y_n$ are called second order Backward Differences.

Backward Difference Table :-

x	y	∇	∇^2	∇^3	∇^4
x_0	y_0	∇y_1			
x_1	y_1	∇y_2	$\nabla^2 y_2$	$\nabla^3 y_3$	
x_2	y_2	∇y_3	$\nabla^2 y_3$	$\nabla^3 y_4$	$\nabla^4 y_4$
x_3	y_3	∇y_4	$\nabla^2 y_4$		
x_4	y_4				

CENTRAL DIFFERENCE

Central difference operator is denoted by δ and

Defined as $\delta y^{1/2} = y_1 - y_0$

$$\delta y^{3/2} = y_2 - y_1$$

$$\delta y^{5/2} = y_3 - y_2$$

$$\delta y^{n-1/2} = y_n - y_{n-1}$$

Table :-

x	y	δ	δ^2	δ^3
x_0	y_0	$\delta y^{1/2}$		
x_1	y_1	$\delta y^{3/2}$	$\delta^2 y_1$	$\delta^3 y^{3/2}$
x_2	y_2	$\delta y^{5/2}$	$\delta^2 y_2$	
x_3	y_3			

INTRODUCTION ABOUT THOMAS SIMPSON



Thomas Simpson FRS was a British Mathematician and Inventor known for the (famous) Simpson's rule to approximate definite integrals. The attribution, as often in mathematics, can be debated: This rule has been found 100 years earlier by Johannes Kepler and in German it is called Keplersche Fassregel.

BORN :- 20 August 1710

DIED :- 14 May 1761 (aged 50)

BOOKS :- A Treatise of algebra, the Natural and Laws of chance Moxe etc.

NUMERICAL INTEGRATION

Numerical Integration is the process of evaluating a Definite Integral $\int_a^b f(x) dx$ from a set of Non numerical value of the integral $f(x)$. If it apply to the Integration of the Function of a single variable the process is called Quadrature.

GENERAL QUADRATURE FORMULA FOR EQUIDISTANCE ORDINATES

Let $y = f(x)$ be a function which takes the values $y_0, y_1, y_2, \dots, y_n$ corresponding to the value $x_0 = a, x_1, x_2, \dots, x_n = b$ then

$$\int_{x_0}^{x_n} y dx = nh \left[y_0 + \frac{n}{2} \Delta y_0 + \frac{n(n-3)}{12} \Delta^2 y_0 + \frac{n(n-2)^2}{24} \Delta^3 y_0 + \dots \right]$$

TRAPEZOIDAL RULE

Let $y = f(x)$ be a function which takes the values $y_0, y_1, y_2, \dots, y_n$ corresponding to the values $x_0 = a, x_1, x_2, \dots, x_n = b$ then

$$\int_a^b y \, dx = \frac{h}{2} [y_0 + y_n + 2(y_1 + y_2 + \dots + y_{n-1})]$$

Evaluate $\int_{-3}^3 x^4 \, dx$ by Trapezoidal rule $h=1$:

Let $y = x^4, \{h=1, [a, b] = [-3, 3]\}$

Let $n=6$

x	-3	-2	-1	0	1	2	3
y	81	16	1	0	1	16	81

By Trapezoidal rule

$$\int_{x_0}^{x_n} y \, dx = \frac{h}{2} [(y_0 + y_n) + 2(y_1 + y_2 + y_3 + \dots + y_{n-1})]$$

$$\int_{-3}^3 x^4 \, dx = \frac{1}{2} [(y_0 + y_6) + 2(y_1 + y_2 + y_3 + y_4 + y_5)]$$

$$= \frac{1}{2} [(81+81) + 2(16+1+0+1+16)]$$

$$= \frac{1}{2} [162 + 2(34)]$$

$$= \frac{230}{2}$$

$$= 115$$

SIMPSON'S ONE THIRD RULE

Let $y = f(x)$ be a function which takes the values $y_0, y_1, y_2, \dots, y_n$ corresponding to values $x_0 = a, x_1, x_2, \dots, x_n = b$ where n is Even then

$$\int_a^b y \, dx = \frac{h}{3} [(y_0 + y_n) + 4(y_1 + y_3 + y_5 + \dots + y_{n-1}) + 2(y_2 + y_4 + y_6 + \dots + y_{n-2})]$$

By using Simpson's $1/3^{\text{rd}}$ rule Evaluate $\int_{-3}^3 x^4 \, dx$ by taking Equidistance ordinates

$$[a, b] = [-3, 3], \quad n = 6, \quad h = \frac{b-a}{n} = \frac{3+3}{6} = \frac{6}{6} = 1$$

x	-3	-2	-1	0	1	2	3
$y = x^4$	81	16	1	0	1	16	81

By Simpson's $1/3^{\text{rd}}$ rule

$$\int_{-3}^3 x^4 \, dx = \frac{h}{3} [(81+81) + 4(16+0+16) + 2(1+1)]$$

$$= 98$$

Simpson's 3/8th Rule

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Date: 7/2/23

Let $y = f(x)$ be function which takes the values $y_0, y_1, y_2, \dots, y_n$ corresponding to the values $x_0, x_1, x_2, \dots, x_n$ such that where n is a multiple of three.

Then

$$\int_a^b y \, dx = \frac{3h}{8} [(y_0 + y_n) + 3(y_1 + y_2 + y_3 + y_4 + \dots + y_{n-1}) + 2(y_5 + y_6 + y_7 + \dots + y_{n-2})]$$

Find the value of $\int_0^1 \frac{dx}{1+x^2}$ by using Simpson's 3/8th rule

Hence obtain approximate value of A in case

Divide $[0, 1]$ into 6 equal sub interval of width

$$h = \frac{b-a}{n} = \frac{1-0}{6} = \frac{1}{6}$$

x	0	1/6	2/6	3/6	4/6	5/6	1
$y = \frac{1}{1+x^2}$	1	0.9729	0.9000	0.8000	0.6923	0.5901	0.5000

By Simpson's 3/8th Rule:

$$\begin{aligned} \int_0^1 \frac{1}{1+x^2} \, dx &= \frac{3h}{8} [(y_0 + y_6) + 3(y_1 + y_2 + y_3 + y_4 + y_5) + 2(y_0 + y_1)] \\ &= \frac{3 \times \frac{1}{6}}{8} [(1 + 0.5000) + 3(0.9729 + 0.9000 + 0.8000 + 0.6923 + 0.5901) + 2(1 + 0.5000)] \end{aligned}$$

$$= 0.485368$$

$$\text{Now } \int_0^1 \frac{1}{1+x^2} dx = (\tan^{-1} x)_0^1$$

$$= \tan^{-1} 1 - \tan^{-1} 0$$

$$= \tan^{-1} (\tan \pi/4) - \tan^{-1} (\tan 0)$$

$$= \frac{\pi}{4} - 0$$

$$= \frac{\pi}{4}$$

$$\text{In case : } \frac{\pi}{4} = 0.485368 \Rightarrow \pi = 4(0.485368)$$

$$= 3.141472$$

INTRODUCTION ABOUT Boole's

Page No. 29

Date : 9-8-21



George Boole was largely self-taught English mathematician, philosopher and logician, most of whose short career was spent as the first professor of mathematics at Queen's College, Cork in Ireland. He worked in the fields of differential equations and algebraic logic and is best known as the author of "The Laws of Thought" (1854) which contains "Boolean Algebra". Boolean logic is credited with laying the foundation for the found, the Boole maintained that.

BORN :- 2 November 1815

DIED :- 8 December 1864 (aged 49)

EDUCATION :- Bain bridge's , commercial academy

SPOUSE (S) :- Mary Everest Boole

ERA :- 19th century philosophy

REGION :- Western philosophy

SCHOOL :- Mathematical foundations of computing

NOTABLE :- Boolean Algebra

IDEAS

Boole's Rule

Let $y = f(x)$ be a function which takes the values $y_0, y_1, y_2, \dots, y_n$ corresponding to the values $x_0 = a, x_1, x_2, \dots, x_n = b$. So that n is a multiple of 4 then

$$\int_a^b y dx = \frac{2h}{45} [7y_0 + 32y_1 + 12y_2 + 32y_3 + 14y_4 + 32y_5 + \dots + 7y_n]$$

Evaluate $\int_0^4 e^x dx$ by Boole's rule

Divide $[0, 4]$ in 4 equal sub intervals with

$$h = 1, h = \frac{b-a}{n} = \frac{4-0}{4} \Rightarrow \frac{4}{4} = 1$$

x	0	1	2	3	4
$y = e^x$	1	2.72	7.39	20.09	54.60

By Boole's Rule

$$\int_0^4 e^x dx = \frac{2h}{45} [7y_0 + 32y_1 + 12y_2 + 32y_3 + 7y_4]$$

$$= \frac{2(1)}{45} [7(1) + 32(2.72) + 12(7.39) + 3(20.09) + 7(54.60)]$$

$$= 0.04444 [121.8] = 53.68$$

ABOUT WILHELM JORDAN

Page No. 31

Date 9-8-21



Wilhelm Jordan was born on March 1st 1842 in Württemberg and died on April 17th of 1899 in Hanover. He was a German geodesist; which is a part of applied mathematics and Earth sciences. He also dealt with Measurement and Representation of the earth in time and space, attaching to it the gravitational field in a third dimensional time varying space (plane and Non-plane). It is because of this work of an engineering assistant for two years that he found a particular interest in Geodesy.

BORN :- 1st March 1842 Ellwangen Germany

DIED :- 17th April 1899 (aged 57)

NATIONALITY :- German

KNOWN FOR :- Gauss - Jordan Elimination

FIELDS :- Geodesy, Geometry

INSTITUTIONS :- Technical University Hanover.

GAUSS ELIMINATION METHOD

Let the Linear System of Equations x_1, x_2, x_3

$$a_{11}x_1 + a_{12}x_2 + a_{13}x_3 = b_1$$

$$a_{21}x_1 + a_{22}x_2 + a_{23}x_3 = b_2$$

$$a_{31}x_1 + a_{32}x_2 + a_{33}x_3 = b_3$$

write the Equations in tabular form as

x_1	x_2	x_3	b
a_{11}	a_{12}	a_{13}	b_1
a_{21}	a_{22}	a_{23}	b_2
a_{31}	a_{32}	a_{33}	b_3

GAUSS JORDAN METHOD

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Date 7-8-21

This Method is a Modification of given gauss elimination method.

Let the system of Equations in x, y, z are

$$a_1x + b_1y + c_1z = d_1$$

$$a_2x + b_2y + c_2z = d_2$$

$$a_3x + b_3y + c_3z = d_3$$

$$\text{Augmented Matrix (AB)} = \begin{bmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{bmatrix}$$

Reduce the above Matrix in following form by using row operation.

$$(AB) = \begin{bmatrix} 1 & 0 & 0 & \alpha \\ 0 & 1 & 0 & \beta \\ 0 & 0 & 1 & \gamma \end{bmatrix}$$

$$\text{Solution } x = \alpha, y = \beta, z = \gamma$$

Solve the system of Equations $5x + 2y + z = 12$,
 $x + 4y + 2z = 15$, $x + 2y + 5z = 20$ by gauss Jordan.

Given Equations $5x + 2y + z = 12$, $x + 4y + 2z = 15$, $x + 2y + 5z = 20$

$$\text{Augmented Matrix (AB)} = \begin{bmatrix} 5 & 2 & 1 & 12 \\ 1 & 4 & 2 & 15 \\ 1 & 2 & 5 & 20 \end{bmatrix} \quad R_1 \leftrightarrow R_3$$

$$= \begin{bmatrix} 1 & 2 & 5 & 20 \\ 1 & 4 & 2 & 15 \\ 5 & 2 & 1 & 12 \end{bmatrix} \quad R_2' \rightarrow R_2 - R_1$$

$$\sim \begin{bmatrix} 1 & 2 & 5 & 20 \\ 0 & 2 & -3 & -5 \\ 0 & -8 & -24 & -88 \end{bmatrix} \quad R_3 \rightarrow \frac{R_3}{-8}$$

$$\sim \begin{bmatrix} 1 & 2 & 5 & 20 \\ 0 & 2 & -3 & -5 \\ 0 & 1 & 3 & 11 \end{bmatrix} \quad R_2 \rightarrow R_3$$

$$\sim \begin{bmatrix} 1 & 2 & 5 & 20 \\ 0 & 1 & 3 & 11 \\ 0 & 2 & -3 & -5 \end{bmatrix} \quad \begin{array}{l} R_1 \rightarrow R_1 - 2R_2 \\ R_3 \rightarrow R_3 - 2R_2 \end{array}$$

$$\sim \begin{bmatrix} 1 & 0 & -1 & -2 \\ 0 & 1 & 3 & 11 \\ 0 & 0 & -9 & 27 \end{bmatrix} \quad R_3 \rightarrow \frac{R_3}{-9}$$

$$\sim \begin{bmatrix} 1 & 0 & -1 & -2 \\ 0 & 1 & 3 & 11 \\ 0 & 0 & 1 & 3 \end{bmatrix} \quad \begin{array}{l} R_1 \rightarrow R_1 + R_3 \\ R_2 \rightarrow R_2 - 3R_3 \end{array}$$

$$\sim \begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 12 \\ 0 & 0 & 0 & 13 \end{bmatrix}$$

$$\therefore x = 1, y = 2, z = 3$$

AbelGaussTreubBORN

:- 10 December 1801, Potsdam,
Kingdom of Prussia.

DIED

:- 18 February 1851 (aged 49)

RESIDENCE

:- Prussia

NATIONALITY

:- German

ALMA MATER

:- University of Berlin

FIELDS

:- Mathematician

DOCTORAL

ADVISOR :- Ernst Dirksen [in]

DOCTORAL

STUDENTS :- Paul Gordan, Otto Meissner,
Friedrich Julius Richelot.



BIOGRAPHY

Jacobi was born in Ashkenazi, Jewish parentage in postsdam on 10th December 1804; He was the second of four children of banker Simon Jacobi his elder brother Moritz. Von Jacobi would also become later an Engineer and physicist. He was initially home schooled by his uncle Lehman who instructed him in the classical languages and elements of Mathematics. In 1816, the twelve-year old Jacobi went to the postsdam Gymnasium, where students were being taught classical language, German story as well as mathematics, as a result of the good education received from his uncle as well as his own remarkable abilities after less than half a year Jacobi was moved to the senior year despite his young age.

Why we use Gauss Seidal Method;

In Numerical linear algebra, the Gauss Seidal Method, also known as the Liebmann method or the Method

of American displacement is an American method
and is also a Chinese system of operations. It
was only mentioned in a private letter from General
to the United States in 1928.

Gauss Jordan Elimination

Solve the following equations by Gauss-Jordan method

$$x + 2y + 3z = 4; \quad x + 3y + 2z = 5; \quad x + y + z = 3$$

Given Equations

$$x + 2y + 3z = 4$$

$$x + 3y + 2z = 5$$

$$x + y + z = 3$$

$$x = \frac{1}{3} [4 - 2y - 3z]$$

$$y = \frac{1}{2} [5 - x - 2z]$$

$$z = \frac{1}{2} [3 - x - y]$$

I cycle \rightarrow put $x=0, y=0, z=0$

$$x = \frac{1}{3} [4 - 0 - 0] = \frac{4}{3} = 1.33$$

$$y = \frac{1}{2} [5 - 0 - 0] = \frac{5}{2} = 2.5$$

$$z = \frac{1}{2} [3 - 0 - 0] = \frac{3}{2} = 1.5$$

II cycle \rightarrow put $x=1.33, y=2.5, z=1.5$

$$x = \frac{1}{3} [0 - 2(1) - 1] = -\frac{1}{3}$$

$$y = \frac{1}{3} [1 - 2(1) - 2(1)] = -\frac{1}{3}$$

$$z = \frac{1}{3} [0 - 2(1) - 1] = -\frac{1}{3}$$

So, $x = -\frac{1}{3}, y = -\frac{1}{3}, z = -\frac{1}{3}$

$$x = \frac{1}{3} [0 - 2(1) - 1] = -\frac{1}{3}$$

$$y = \frac{1}{3} [1 - 2(1) - 2(1)] = -\frac{1}{3}$$

$$z = \frac{1}{3} [0 - 2(1) - 1] = -\frac{1}{3}$$

Interpretation

Eqn	x	y	z
I	-1/3	-1/3	-1/3
II	-1/3	-1/3	-1/3
III	-1/3	-1/3	-1/3

PROJECT WORK

ON

INTEGRAL TRANSFORMS



Amit Lakshmi Debbarma

He was born on 20 September 1948 in India. He received both master and a Doctorate degree from "University of Calcutta" in pure mathematics in "1975". He obtained a "PhD" in applied mathematics in University of London in "1987". His Doctoral Advisor was Simon Rosenberg. He is currently a professor of Mathematics at University of Texas Rio Grande Valley. He was a professor at University of Central Florida from "1983 to 2001".

He is a founder of the Mathematical Journal International Journal of mathematics and Mathematical Sciences.

He has received the "Full Bright Award" as well as the NSF, "Scientist award".

BORN :- September 3, 1935 (age 83)

ALMA MATER :- University of Calcutta ,
University of London.

FIELDS :- Mathematical physics.

INSTITUTIONS :- University of Central florida
University of Texas
Rio Grande valley

THE SIS :- Transient wave motions in fluids (1964)

DOCTORAL
ADVISOR :- Simon Rieublat [1]

To Solve DIFFERENTIAL EQUATIONS - I

Given $\frac{d^2y}{dx^2} + p \frac{dy}{dx} + qy = f(x)$

$$(D^2 + pD + q)y = f(x)$$

$$y'' + py' + qy = f(x)$$

Taking Laplace Transformation

$$L\{y'' + py' + qy\} = L\{f(x)\}$$

$$L\{y''\} + pL\{y'\} + qL\{y\} = L\{f(x)\}$$

$$\text{Since } L\{y'\} = pL\{y\} - y(0)$$

$$L\{y''\} = p^2L\{y\} - py(0) - y'(0)$$

Using these Substitution Find 'y'

This is the required solutions.

Solve $\frac{d^2y}{dt^2} + y = 0$ then $y=1$, $\frac{dy}{dx} = 0$ at $t = 0$.

Given $\frac{d^2y}{dt^2} + y = 0$

$$y'' + y = 0$$

Taking Laplace Transform on both sides

$$L\{y''\} + L\{y\} = 0$$

$$p^2 L\{y\} - py(0) - y'(0) + L\{y\} = 0$$

$$p^2 L\{y\} - p \cdot 1 - 0 + L\{y\} = 0$$

$$(p^2 + 1) L\{y\} = p$$

$$L\{y\} = \frac{p}{p^2 + 1}$$

$$y = L^{-1} \left[\frac{p}{p^2 + 1} \right]$$

$$y = \cos t$$

$\therefore y = \cos t$ is the solution.



PRINCIPAL
S.K.P. Govt. Degree College
GUNTAKAL, Anantapur District

S K P GOVERNMENT DEGREE COLLEGE GUNTAKAL

Ananthapuramu District.

DEPARTMENT OF MATHEMATICS

PROJECT WORK 2021-22



CERTIFICATE

This is to certify that the Project "Integral Transform and Advanced Numerical Analysis" is a bonafide work T. prabhavathi - III mpc
200151175 submitted to faculty of Mathematics Department in Partially fulfillment of the requirements for the award of Degree of Bachelor of Science in Mathematics from SKP Govt. Degree College, Guntakal.

Project Guide

K. Anjaneyulu
Head of the Department

Lecturer in Mathematics
S.K.P. Govt. Degree College
Guntakal

B. Siva Prasad
External Examiner



THIRUVAL
S.K.P. Govt. Degree College
GUNTAKAL, Ananthapuramu (A.P.)

Project Work

Integral Transform.

①

Solve $(D^2 - 2D + 2)y = 0$, $y = Dy = 1$ when $t = 0$

Sol

Given differential equation is,

$$(D^2 - 2D + 2)y = 0 \Rightarrow \boxed{y'' - 2y' + 2y = 0} \rightarrow \textcircled{1}$$

Taking Laplace Transform on both sides,

$$L\{y'' - 2y' + 2y\} = 0$$

$$\Rightarrow L\{y''\} - 2L\{y'\} + 2L\{y\} = 0$$

$$\boxed{P^2 L(y) - Py(0) - y'(0) - 2[PL(y) - y(0)] + 2L(y) = 0} \rightarrow \textcircled{2}$$

$$\text{Since } y(0) = y'(0) = 1$$

$$\Rightarrow P^2 L(y) - [P(1)] - 1 - 2[P L(y) - 1] + 2L(y) = 0$$

$$\Rightarrow P^2 L(y) - P(1) - 1 - 2P L(y) + 2 + 2L(y) = 0$$

$$\Rightarrow L(y) = \frac{P-1}{P^2-2P+2} = \frac{P-1}{(P-1)^2+1}$$

$$\Rightarrow y = L^{-1}\left\{\frac{P-1}{(P-1)^2+1}\right\} = e^t \cos t$$

$$\Rightarrow y = e^t \cos t$$

②

Solve $\frac{d^2 y}{dx^2} + y = 6 \cos 2t$, if $y = 3$ $Dy = 1$ when $t = 0$

Sol

Given differential equation is, $\frac{d^2 y}{dt^2} + y = 6 \cos 2t$

$$\Rightarrow \boxed{y'' + y = 6 \cos 2t} \rightarrow \textcircled{1}$$

Taking Laplace transform on both sides

$$L\{y'' + y\} = 6L\{\cos 2t\}$$

$$\Rightarrow L\{y''\} + L\{y\} = 6L\{\cos 2t\}$$

$$\Rightarrow L\{y''\} + L\{y\} = 6\left(\frac{P}{P^2+4}\right)$$

$$\Rightarrow P^2 L(y) - Py(0) - y'(0) + Ly = 6\left(\frac{P}{P^2+4}\right) \rightarrow \textcircled{2}$$

$$\text{Since } y(0)=3 \text{ and } y'(0)=1$$

$$\Rightarrow (P^2+1)L(y) - P(3) - 1 = \frac{6P}{P^2+4}$$

$$\Rightarrow (P^2+1)L(y) = \frac{6P}{P^2+4} + 3P + 1$$

$$\Rightarrow L(y) = \frac{6P}{(P^2+1)(P^2+4)} + \frac{3P}{P^2+1} + \frac{1}{P^2+1}$$

$$\Rightarrow y = L^{-1}\left\{\frac{6P}{(P^2+1)(P^2+4)} + \frac{3P}{P^2+1} + \frac{1}{P^2+1}\right\} \rightarrow \textcircled{3}$$

$$\text{Let } \frac{6P}{(P^2+1)(P^2+4)} = \frac{AP+B}{P^2+1} + \frac{CP+D}{P^2+4} \rightarrow \textcircled{4}$$

$$\Rightarrow \frac{6P}{(P^2+1)(P^2+4)} = \frac{AP(P^2+4) + B(P^2+4) + CP(P^2+1) + D(P^2+1)}{(P^2+1)(P^2+4)}$$

$$\Rightarrow 6P = A(P^3+4P) + B(P^2+4) + C(P^3+1) + D(P^2+1)$$

$$\boxed{A+C=0} \rightarrow \textcircled{5} \quad \boxed{B+D=0} \rightarrow \textcircled{6} \quad \boxed{4A+C=6} \rightarrow \textcircled{7} \quad \boxed{4B+D=0} \rightarrow \textcircled{8}$$

Solving $\textcircled{5}$ and $\textcircled{7}$

$$\begin{array}{r} A+C=0 \\ 4A+C=6 \\ \hline -3A=-6 \end{array}$$

$$\boxed{A=2}$$

$$\Rightarrow 2+C=0$$

$$\boxed{C=-2}$$

Solving $\textcircled{6}$ and $\textcircled{8}$

$$\begin{array}{r} B+D=0 \\ 4B+D=0 \\ \hline -3B=0 \\ B=0 \end{array}$$

$$0+D=0$$

$$\boxed{D=0}$$

Sub above values in ④

$$\frac{6P}{(P^2+1)(P^2+4)} = \frac{2P}{(P^2+1)} - \frac{2P}{(P^2+4)}$$

From equation ③

$$y = L^{-1} \left\{ \frac{2P}{P^2+1} - \frac{2P}{P^2+4} + \frac{3P}{P^2+1} + \frac{1}{P^2+1} \right\}$$

$$= L^{-1} \left\{ \frac{5P}{P^2+1} - \frac{2P}{P^2+4} + \frac{1}{P^2+1} \right\}$$

$$= 5 L^{-1} \left\{ \frac{P}{P^2+1} \right\} - 2 L^{-1} \left\{ \frac{P}{P^2+4} \right\} + L^{-1} \left\{ \frac{1}{P^2+1} \right\}$$

$$= 5 \cos t - 2 \cos 2t + \sin t$$

③

Solve $ty'' + 2y' + ty = 0$ if $y(0) = 1$ and $y(\pi) = 0$

sol

Given differential Equation is $ty'' + 2y' + ty = 0$

Taking Laplace transform on both sides

$$L\{ty''\} + 2L\{y'\} + L\{ty\} = 0$$

$$\Rightarrow (-1) \frac{d}{dp} L(y'') + 2[pL(y) - y(0)] + (-1) \frac{d}{dp} L(y) = 0$$

$$\Rightarrow -\frac{d}{dp} [p^2 L(y) - py(0) - y'(0)] + 2pL(y) - 2y(0) - \frac{d}{dp} L(y) = 0$$

Since $y(0) = 1$ and Let $y'(0) = A$

$$\Rightarrow -\frac{d}{dp} [p^2 L(y) - p(1) - y'(0)] + 2pL(y) - 2y(0) - \frac{d}{dp} L(y) = 0$$

$$\Rightarrow -\frac{d}{dp} [p^2 L(y) - p - A] + 2pL(y) - 2(1) - \frac{d}{dp} L(y) = 0 \rightarrow \text{①}$$

$$\text{Let } z = L(y)$$

$$\Rightarrow -\frac{d}{dp} (p^2 z - p - 1) + 2pz - 2 - \frac{d}{dp} (z) = 0$$

$$\Rightarrow -\frac{d}{dp} (p^2 z) + 1 + 0 + 2pz - 2 - \frac{dz}{dp} = 0$$

$$\Rightarrow -\left[p^2 \frac{dz}{dp} + 2pz\right] + (-1) + 2pz - \frac{dz}{dp} = 0$$

$$\Rightarrow -p^2 \frac{dz}{dp} - 2pz - 1 + 2pz - \frac{dz}{dp} = 0$$

$$\Rightarrow \frac{dz}{dp} (-p^2 - 1) - 1 = 0$$

$$\Rightarrow \frac{dz}{dp} (-p^2 - 1) = 1$$

$$\Rightarrow \frac{dz}{dp} = \frac{1}{-p^2 - 1} = \frac{-1}{p^2 + 1}$$

$$dz = \frac{-1}{p^2 + 1} dp$$

integrating both sides

$$\int dz = -\int \frac{1}{p^2 + 1} dp = -\int \frac{1}{1 + p^2} dp$$

$$\Rightarrow z = -\tan^{-1} p + c$$

$$\Rightarrow \lim_{p \rightarrow \infty} L(y) = -\lim_{p \rightarrow \infty} \tan^{-1} p + c$$

$$0 = -\tan^{-1} \infty + c = -\frac{\pi}{2} + c \Rightarrow \boxed{c = \frac{\pi}{2}}$$

$$L(y) = z = -\tan^{-1} p + \frac{\pi}{2} = -(-\cot^{-1} p)$$

$$y = L^{-1}\{\cot^{-1} p\}$$

$$\boxed{y = \frac{\sin t}{t}}$$

f) Solve $(D^2 - 3)x - 4y = 0$, $x + (D^2 + 1)y = 0$, $t > 0$ if $x = y = Dy = 0$

$Dx = 2$ when $t = 0$

Sol:

Given ordinary differential equations are

$$(D^2-3)x-4y=0$$

$$x+(D^2+1)y=0$$

$$\Rightarrow x''-3x-4y=0$$

$$\Rightarrow x+y''+y=0$$

Taking Laplace transform on both sides

$$\Rightarrow L\{x''\} - 3L\{x\} - 4L\{y\} = 0 \quad \Rightarrow L\{x\} + L\{y''\} + L\{y\} = 0$$

$$\Rightarrow p^2 L(x) - px(0) - x'(0) - 3L(x) - 4Ly = 0 \quad \Rightarrow L(x) + p^2 L(y) - py(0) - y'(0) + L(y) = 0$$

Since $x(0)=0$, $y(0)=0$, $y'(0)=0$, $x'(0)=2$

$$\Rightarrow p^2 L(x) - 2 - 3L(x) - 4Ly = 0 \quad \Rightarrow L(x) + p^2 L(y) + Ly = 0$$

Let $\bar{x} = L(x)$ and $\bar{y} = L(y)$

$$\Rightarrow p^2 \bar{x} - 2 - 3\bar{x} - 4\bar{y} = 0$$

$$\Rightarrow \bar{x} + p^2 \bar{y} + \bar{y} = 0$$

$$\Rightarrow (p^2-3)\bar{x} - 4\bar{y} = 2 \rightarrow \textcircled{1}$$

$$\Rightarrow \bar{x} + (p^2+1)\bar{y} = 0 \rightarrow \textcircled{2}$$

Solving $\textcircled{1}$ & $\textcircled{2}$

$$\textcircled{1} \times (p^2+1) \Rightarrow (p^2+1)(p^2-3)\bar{x} - 4(p^2+1)\bar{y} = 2(p^2+1)$$

$$\textcircled{2} \times 4 \Rightarrow 4\bar{x} + 4(p^2+1)\bar{y} = 0$$

$$[(p^2+1)(p^2-3)+4]\bar{x} = 2p^2+2$$

$$\Rightarrow [p^2-3p^2+p^2-3+4]\bar{x} = 2p^2+2$$

$$\Rightarrow [p^4-2p^2+1]\bar{x} = 2p^2+2$$

$$\Rightarrow \bar{x} = \frac{2p^2+2}{(p^2-1)^2}$$

$$L(x) = \frac{2(p^2+1)}{(p-1)^2(p+1)^2} \rightarrow (3)$$

$$\text{Let } \frac{2p^2+2}{(p-1)^2(p+1)^2} = \frac{A}{(p-1)^2} + \frac{B}{(p-1)} + \frac{C}{(p+1)^2} + \frac{D}{(p+1)}$$

$$\begin{aligned} \Rightarrow 2p^2+2 &= A(p+1)^2 + B(p-1)(p+1)^2 + C(p-1)^2 + D(p-1)^2(p+1) \\ &= A(p^2+2p+1) + B(p-1)(p^2+2p+1) + C(p^2-2p+1) \\ &\quad + D(p^2-2p+1)(p+1) \\ &= A(p^2+2p+1) + B(p^3+p^2-p-1) + C(p^2-2p+1) + D(p^3-p^2-p+1) \end{aligned}$$

$$B+D=0 \rightarrow (4) \quad A+B+C+D=2 \rightarrow (5)$$

$$2A-B-2C-D=0 \rightarrow (6) \quad A-B+C+D=2 \rightarrow (7)$$

Solving (5) and (7)

$$A+B+C+D=2$$

$$A-B+C+D=2$$

$$2A+2C=4 \Rightarrow A+C=2 \rightarrow (8)$$

Solving (5) and (7)

$$A+B+C+D=2$$

$$A-B+C+D=2$$

$$2B-2D=0$$

$$B-D=0 \rightarrow (9)$$

Solving (4) and (9)

$$B+D=0$$

$$B-D=0$$

$$2B=0$$

$$B=0$$

Sub B value in (9) $\Rightarrow D=0$

Sub B and D values in (6) $2A-0-2C-0=0$

$$A-C=0 \rightarrow (10)$$

Solving (8) and (10)

$$A-C=0$$

$$A+C=2$$

$$2A=2 \Rightarrow A=1$$

Sub A value in ⑧, $1+C=2 \Rightarrow \boxed{C=1}$

$$\frac{2p^2+2}{(p-1)^2(p+1)^2} = \frac{1}{(p-1)^2} + \frac{1}{(p+1)^2}$$

From equation

$$L(x) = \frac{1}{(p-1)^2} + \frac{1}{(p+1)^2}$$

$$x = L^{-1}\left\{\frac{1}{(p-1)^2}\right\} + L^{-1}\left\{\frac{1}{(p+1)^2}\right\}$$

$$= e^t t' + e^{-t} t'$$

$$= t(e^t + e^{-t}) = 2t\left(\frac{e^t + e^{-t}}{2}\right)$$

$$\boxed{x = 2t \cosh t}$$

Solving eqn ① and ② again

$$\textcircled{1} \times 1 \Rightarrow (p^2-3)\bar{x} - 4\bar{y} = 2$$

$$\textcircled{2} \times (p^2-3) \Rightarrow \cancel{(p^2-3)\bar{x}} + (p^2+1)(p^2-3)\bar{y} = 0$$

$$-\left[(p^2+1)(p^2-3)+4\right]\bar{y} = 2$$

$$\Rightarrow (p^4-2p^2+1)\bar{y} = -2$$

$$\Rightarrow \bar{y} = \frac{-2}{p^4-2p^2+1}$$

$$\Rightarrow L(y) = \frac{-2}{(p^2-1)^2} = \frac{-2}{(p+1)^2(p-1)^2} \rightarrow \textcircled{11}$$

$$\text{Let } \frac{-2}{(p+1)^2(p-1)^2} = \frac{A}{(p+1)^2} + \frac{B}{(p+1)} + \frac{C}{(p-1)^2} + \frac{D}{p-1}$$

$$\Rightarrow -2 = \cancel{A(p+1)} A(p-1)^2 + B(p+1)(p-1)^2 + C(p+1)^2 + D(p-1)(p+1)^2$$

$$\Rightarrow -2 = A(p^2+1-2p) + B(p^3-p^2-p+1) + C(p^2+2p+1) + D(p^3+p^2-p-1)$$

$$\boxed{B+D=0} \rightarrow (12) \quad \boxed{A-B+C+D=0}$$

$$\boxed{-2A-B+2C-D=0} \rightarrow (14) \quad \boxed{A+B+C-D=-2} \rightarrow (15)$$

Solving (13) and (15)

$$\begin{array}{r} A-B+C+D=0 \\ A+B+C-D=-2 \\ \hline -2B+2D=2 \end{array}$$

$$\Rightarrow \boxed{-B+D=1} \rightarrow (16)$$

Solving (12) & (16)

$$\begin{array}{r} B+D=0 \\ -B+D=1 \\ \hline 2D=1 \\ \boxed{D=\frac{1}{2}} \end{array}$$

Sub 'D' value in (12). $B+\frac{1}{2}=0 \Rightarrow \boxed{B=-\frac{1}{2}}$

Sub B and D values in (13) and (14)

$$A - (-\frac{1}{2}) + C + \frac{1}{2} = 0 \quad -2A - (-\frac{1}{2}) + 2C - \frac{1}{2} = 0$$

$$\boxed{A+C=-1} \rightarrow (17)$$

$$\boxed{-A+C=0} \rightarrow (18)$$

Solving equation (17) and (18)

$$\begin{array}{r} A+C=-1 \\ -A+C=0 \\ \hline 2C=-1 \\ \boxed{C=-\frac{1}{2}} \end{array}$$

Sub 'C' value in (18)

$$-A + (-\frac{1}{2}) = 0 \Rightarrow \boxed{A=-\frac{1}{2}}$$

$$L(y) = \frac{-2}{(p+1)^2(p-1)^2} = \frac{-1}{2(p+1)^2} - \frac{1}{2(p+1)} - \frac{1}{2(p-1)^2} + \frac{1}{2(p-1)}$$

$$\Rightarrow L(y) = -\frac{1}{2} \left\{ \frac{1}{(p+1)^2} + \frac{1}{(p+1)} + \frac{1}{(p-1)^2} - \frac{1}{p-1} \right\}$$

$$y = -\frac{1}{2} \left[L^{-1} \left\{ \frac{1}{(p+1)^2} \right\} + L^{-1} \left\{ \frac{1}{(p+1)} \right\} + L^{-1} \left\{ \frac{1}{(p-1)^2} \right\} - L^{-1} \left\{ \frac{1}{(p-1)} \right\} \right]$$

$$= -\frac{1}{2} \left[e^{-t} L^{-1} \left(\frac{1}{p^2} \right) + e^{-t} + e^t L^{-1} \left(\frac{1}{p^2} \right) - e^t \right]$$

$$= -\frac{1}{2} [te^{-t} + e^{-t} + te^t - e^t]$$

$$y = -\frac{1}{2} [e^{-t}(t+1) + e^t(t-1)]$$

- ⑤ Solve the equations $\frac{dx}{dt} + y = \sin t$, $\frac{dy}{dt} + x = \cos t$ given that $x=2$ and $y=0$ at $t=0$

Sol

Given differential equations are

$$\frac{dx}{dt} + y = \sin t$$

$$\frac{dy}{dt} + x = \cos t$$

$$x' + y = \sin t$$

$$y' + x = \cos t$$

taking Laplace Transform on both sides

$$\Rightarrow L\{x'\} + L(y) = L\{\sin t\}$$

$$\Rightarrow L\{y'\} + L(x) = L\{\cos t\}$$

$$\Rightarrow PL(x) - x(0) + L(y) = \frac{1}{P^2+1}$$

$$\Rightarrow PL(y) - y(0) + L(x) = \frac{P}{P^2+1}$$

$$\Rightarrow P\bar{x} - 2 + L(y) = \frac{1}{P^2+1}$$

$$\Rightarrow PL(y) - 0 + L(x) = \frac{P}{P^2+1}$$

$$\Rightarrow P\bar{x} + \bar{y} = \frac{1}{P^2+1} + 2$$

$$\Rightarrow P\bar{y} + \bar{x} = \frac{P}{P^2+1}$$

$$\Rightarrow P\bar{x} + \bar{y} = \frac{1+2P^2+2}{P^2+1}$$

$$\Rightarrow \boxed{\bar{x} + P\bar{y} = \frac{P}{P^2+1}} \rightarrow (2)$$

$$\boxed{P\bar{x} + \bar{y} = \frac{2P^2+3}{P^2+1}} \rightarrow (1)$$

solving (1) and (2)

$$(1) \times P \Rightarrow P^2\bar{x} + P\bar{y} = \frac{P(2P^2+3)}{P^2+1}$$

$$(2) \times 1 \Rightarrow \bar{x} + P\bar{y} = \frac{P}{P^2+1}$$

$$(P^2-1)\bar{x} = \frac{2P^3+3P-P}{P^2+1}$$

$$[(P+1)(P-1)]\bar{x} = \frac{2P^3+2P}{P^2+1}$$

$$L(x) = \frac{2P^3+2P}{(P^2+1)(P+1)(P-1)}$$

$$\text{Let } \frac{2P^3+2P}{(P^2+1)(P+1)(P-1)} = \frac{A}{P+1} + \frac{B}{P-1} + \frac{CP+D}{P^2+1}$$

$$\Rightarrow 2P^3+2P = A[(P-1)(P^2+1)] + B(P+1)(P^2+1) + (CP+D)(P^2-1)$$

$$= A(P^3+P-P^2-1) + B(P^3+P+P^2+1) + C(P^3-P) + D(P^2-1)$$

$$A+B+C=2 ; -A+B+D=0 ; A+B-C=2 ; -A+B-D=0$$

$$A+B+C=2$$

$$A+B-C=2$$

$$2A+2B=4$$

$$A+B=2$$

$$-A+B+D=0$$

$$-A+B-D=0$$

$$-2A+2B=0$$

$$-A+B=0$$

$$A+B+C=2$$

$$A+B-C=2$$

$$2C=0$$

$$C=0$$

$$A+B=2$$

$$-A+B=0$$

$$2B=2$$

$$B=1$$

$$A+B+C=2$$

$$\Rightarrow A+1+0=2$$

$$A=1$$

$$-A+B+D=0$$

$$\Rightarrow -1+1+D=0$$

$$\Rightarrow D=0$$

$$\therefore \frac{2P^3+2P}{(P^2+1)(P+1)(P-1)} = \frac{1}{(P+1)} + \frac{1}{(P-1)}$$

$$\Rightarrow L(x) = \frac{1}{P+1} + \frac{1}{P-1}$$

$$\Rightarrow x = L^{-1}\left\{\frac{1}{P+1}\right\} + L^{-1}\left\{\frac{1}{P-1}\right\}$$

$$x = e^{-t} + e^t$$

Solving ① and ②

$$\textcircled{1} \times 1 \Rightarrow P\bar{x} + \bar{y} = \frac{2P^2+3}{P^2+1}$$

② XP

$$\cancel{P^2} + P^2 \bar{y} = \frac{P^2}{P^2+1}$$

$$(1-P^2)\bar{y} = \frac{2P^2+3-P^2}{P^2+1}$$

$$\Rightarrow -(P^2-1)\bar{y} = \frac{P^2+3}{P^2+1}$$

$$\Rightarrow \bar{y} = \frac{-(P^2+3)}{(P^2+1)(P+1)(P-1)}$$

$$L(y) = \frac{-(P^2+3)}{(P^2+1)(P+1)(P-1)}$$

$$\frac{P^2+3}{(P^2+1)(P+1)(P-1)} = \frac{A}{P+1} + \frac{B}{P-1} + \frac{Cp+D}{P^2+1}$$

$$\Rightarrow P^2+3 = \cancel{A(P-1)(P^2+1)} + A(P-1)(P^2+1) + B(P+1)(P^2+1) + (Cp+D)(P^2-1)$$

$$= A(P^3-P^2+P+1) + B(P^3+P^2+P+1) + C(P^3-P) + D(P^2-1)$$

$$A+B+C=0; \quad -A+B+D=1; \quad A+B-C=0; \quad -A+B-D=3$$

$$A+B+C=0$$

$$A+B-C=0$$

$$2A+2B=0$$

$$A+B=0$$

$$A+B=0$$

$$-A+B=2$$

$$2B=2$$

$$B=1$$

$$A+B+C=0$$

$$A+B-C=0$$

$$2C=0$$

$$C=0$$

$$A+B=0$$

$$A+1=0$$

$$A=-1$$

$$-A+B+D=1$$

$$-A+B-D=3$$

$$-2A+2B=4$$

$$-A+B=2$$

$$-A+B-D=3$$

$$1+1-D=3$$

$$D=-1$$

$$\frac{p^3 - 8}{(p^3 + 1)(p + 1)(p - 1)} = \frac{-1}{p + 1} + \frac{1}{p - 1} + \frac{1}{p^2 + 1}$$

$$L(y) = - \left[\frac{-1}{p + 1} + \frac{1}{p - 1} + \frac{1}{p^2 + 1} \right]$$

$$y = L^{-1} \left\{ \frac{1}{p + 1} \right\} - L^{-1} \left\{ \frac{1}{p - 1} \right\} + L^{-1} \left\{ \frac{1}{p^2 + 1} \right\}$$

$$\boxed{y = e^{-t} - e^t + \sin t}$$

(6) Solve $\frac{\partial y}{\partial t} = 2 \frac{\partial^2 y}{\partial x^2}$ where $y(0, t) = 0 = y(5, t)$ and $y(x, 0) = 10 \sin 4\pi x$

Sol:- Given partial differential equation is,

$$\boxed{\frac{\partial y}{\partial t} = 2 \frac{\partial^2 y}{\partial x^2}} \quad \text{--- (1)}$$

applying Laplace Transform on both sides

$$L \left\{ \frac{\partial y}{\partial t} \right\} = 2 L \left\{ \frac{\partial^2 y}{\partial x^2} \right\}$$

$$p \bar{y}(x, p) - y(x, 0) = 2 \left[\frac{\partial^2 \bar{y}}{\partial x^2}(x, p) \right]$$

Since $y(x, 0) = 10 \sin 4\pi x$

$$p \bar{y}(x, p) - 10 \sin 4\pi x = 2 \frac{d^2 \bar{y}}{dx^2}(x, p)$$

$$p \bar{y} - 2 \frac{d^2 \bar{y}}{dx^2} = 10 \sin 4\pi x$$

$$-(2D^2 - p) \bar{y} = 10 \sin 4\pi x$$

$$\Rightarrow [2D^2 - p] \bar{y} = -10 \sin 4\pi x$$

$$\boxed{\left[D^2 - \frac{p}{2} \right] \bar{y} = -5 \sin 4\pi x} \quad \text{--- (2)}$$

Auxiliary equation is $f(m) = 0$

$$m^2 - \frac{p}{2} = 0$$

$$m^2 = p/2$$

$$m = \pm \sqrt{\frac{p}{2}}$$

$$\text{let } \alpha = \sqrt{\frac{p}{2}} \text{ and } \beta = -\sqrt{\frac{p}{2}}$$

Complementary function is $y_c = c_1 e^{\alpha x} + c_2 e^{\beta x}$

$$\Rightarrow y_c = c_1 e^{\sqrt{\frac{p}{2}} x} + c_2 e^{-\sqrt{\frac{p}{2}} x}$$

$$\text{particular integral } y_p = \frac{1}{D^2 - \frac{p}{2}} (-5 \sin 4\pi x)$$

$$y_p = -5 \left[\frac{1}{D^2 - \frac{p}{2}} \right] \sin 4\pi x \quad D^2 = -16\pi^2$$

$$= -5 \left[\frac{1}{-16\pi^2 - \frac{p}{2}} \right] \sin 4\pi x$$

$$= 5 \left[\frac{2}{32\pi^2 + p} \right] \sin 4\pi x$$

$$y_p = \frac{10}{32\pi^2 + p} \sin 4\pi x$$

\therefore General solution of (2) is $\bar{y} = y_c + y_p$

$$\Rightarrow \bar{y}(x, p) = c_1 e^{\sqrt{\frac{p}{2}} x} + c_2 e^{-\sqrt{\frac{p}{2}} x} + \frac{10}{32\pi^2 + p} \sin 4\pi x \rightarrow (3)$$

$$\text{Since } y(0, t) = 0 \Rightarrow \bar{y}(0, p) = 0$$

$$\text{from (3) } \bar{y}(0, p) = c_1 + c_2 + 0$$

$$c_1 + c_2 = 0 \rightarrow (4)$$

$$\text{Since } y(5, t) = 0 \Rightarrow \bar{y}(5, p) = 0$$

$$\text{From (3), } \bar{y}(5, p) = c_1 e^{5\sqrt{\frac{p}{2}}} + c_2 e^{-5\sqrt{\frac{p}{2}}} + \frac{10}{32\pi^2 + p} \sin 20\pi$$

$$\Rightarrow \boxed{c_1 e^{5\sqrt{P/2}} + c_2 e^{-5\sqrt{P/2}} = 0} \rightarrow (5)$$

Solving (4) and (5)

$$(4) \times e^{5\sqrt{P/2}} \Rightarrow c_1 e^{5\sqrt{P/2}} + c_2 e^{5\sqrt{P/2}} = 0$$

$$(5) \times 1 \quad c_1 e^{5\sqrt{P/2}} + c_2 e^{-5\sqrt{P/2}} = 0$$

$$\frac{-}{c_2 e^{5\sqrt{P/2}} - c_2 e^{-5\sqrt{P/2}}}$$

$$\Rightarrow c_2 \left[e^{5\sqrt{P/2}} - e^{-5\sqrt{P/2}} \right] = 0$$

$$\boxed{c_2 = 0}$$

From (4) $c_1 + 0 = 0 \Rightarrow \boxed{c_1 = 0}$

Sub $c_1 = 0 = c_2$ in (3)

$$L(y) = \bar{y} = \frac{10}{32\pi^2 + P} \sin 4\pi x$$

$$\Rightarrow y = L^{-1} \left\{ \frac{10}{32\pi^2 + P} \sin 4\pi x \right\}$$

$$\Rightarrow y = 10 \sin 4\pi x \cdot L^{-1} \left\{ \frac{10}{32\pi^2 + P} \right\}$$

$$\boxed{y = 10 (\sin 4\pi x) e^{-32\pi^2 t}}$$

(7) Solve the Integral equation $F(t) = a \sin t - 2 \int_0^t F(u) \cos(t-u) du$

Sol:- Given Integral equation is,

$$\begin{aligned} F(t) &= a \sin t - 2 \int_0^t F(u) \cos(t-u) du \\ &= a \sin t - 2 [F(t) * \cos t] \end{aligned}$$

Taking Laplace Transform on both sides,

$$L\{F(t)\} = a L\{\sin t\} - 2 L\{F(t) * \cos t\}$$

$$= a \frac{1}{p^2+1} - 2 L\{F(t)\} L\{\cos t\}$$

$$= \frac{a}{p^2+1} - 2 L\{F(t)\} \frac{p}{p^2+1}$$

$$\Rightarrow \left[1 + \frac{2p}{p^2+1} \right] L\{F(t)\} = \frac{a}{p^2+1}$$

$$\Rightarrow \frac{p^2+1+2p}{p^2+1} L\{F(t)\} = \frac{a}{p^2+1}$$

$$\Rightarrow \frac{(p+1)^2}{p^2+1} L\{F(t)\} = \frac{a}{p^2+1}$$

$$\Rightarrow L\{F(t)\} = \frac{a}{(p+1)^2}$$

$$\Rightarrow F(t) = ae^{-t} L^{-1}\left\{\frac{1}{p^2}\right\}$$

$$\Rightarrow \boxed{F(t) = ate^{-t}}$$

⑧

Solve the Integral equation $\int_0^t \frac{F(u)}{(t-u)^{1/3}} du = t(1+t)$

Sol:

Given Integral equation is

$$\int_0^t \frac{F(u) du}{(t-u)^{1/3}} = t(1+t)$$

It is also expressed as

$$\int_0^t F(u) (t-u)^{-1/3} du = t+t^2$$

$$\Rightarrow F(t) * t^{-1/3} = t+t^2$$

Taking Laplace Transform on both sides.

$$L\{F(t) * t^{-1/3}\} = L\{t + t^2\}$$

$$\Rightarrow L\{F(t)\} L\{t^{-1/3}\} = L\{t\} + L\{t^2\}$$

$$\Rightarrow L\{F(t)\} \frac{\Gamma(-\frac{1}{3}+1)}{p^{-1/3}+1} = \frac{\Gamma(2)}{p^2} + \frac{\Gamma(3)}{p^3}$$

$$\Rightarrow L\{F(t)\} \frac{\Gamma(2/3)}{p^{2/3}} = \frac{1}{p^2} + \frac{2}{p^3}$$

$$\Rightarrow L\{F(t)\} = \frac{1}{\Gamma(2/3)} \left(\frac{1}{p^{4/3}} + \frac{2}{p^{7/3}} \right)$$

$$F(t) = \frac{1}{\Gamma(2/3)} \left[L^{-1} \left\{ \frac{1}{p^{4/3}} \right\} + 2 L^{-1} \left\{ \frac{1}{p^{7/3}} \right\} \right]$$

$$= \frac{1}{\Gamma(2/3)} \left[\frac{t^{4/3-1}}{\Gamma(4/3)} + 2 \frac{t^{7/3-1}}{\Gamma(7/3)} \right]$$

$$= \frac{1}{\Gamma(2/3)} \left[\frac{t^{1/3}}{\frac{1}{3}\Gamma(1/3)} + 2 \frac{t^{4/3}}{\frac{4}{3}\frac{1}{3}\Gamma(1/3)} \right]$$

$$= \frac{3t^{1/3}}{\Gamma(1-1/3)\Gamma(1/3)} \left[1 + \frac{3t}{2} \right]$$

$$= \frac{3t^{1/3}}{\left(\frac{\pi}{\sin \frac{\pi}{3}} \right)} (1 + \frac{3t}{2}) \quad \left[\because \Gamma(n)\Gamma(1-n) = \frac{\pi}{\sin n\pi} \right]$$

$$= \frac{3\sqrt{3}}{4\pi} t^{1/3} (2+3t)$$

⑨ Find the Fourier Transform of $f(x)$ defined by

$$f(x) = \begin{cases} 1, & |x| < a \\ 0, & |x| > a \end{cases} \text{ and hence evaluate}$$

(i) $\int_{-\infty}^{\infty} \frac{\sin pa \cos px}{p} dp$

(ii) $\int_0^{\infty} \frac{\sin p}{p} dp$

Sol:

$$\text{Given } f(x) = \begin{cases} 1, & |x| < a \\ 0, & |x| > a \end{cases}$$

$$\begin{aligned} \text{W.K.T } F\{f(x)\} &= f(p) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} e^{ipx} f(x) dx \\ &= \frac{1}{\sqrt{2\pi}} \int_{-a}^a e^{ipx} f(x) dx = \frac{1}{\sqrt{2\pi}} \int_{-a}^a e^{ipx} (1) dx \\ &= \frac{1}{\sqrt{2\pi}} \int_{-a}^a e^{ipx} dx = \frac{1}{\sqrt{2\pi}} \left[\frac{e^{ipx}}{ip} \right]_{-a}^a \\ &= \frac{1}{\sqrt{2\pi}} \left[\frac{e^{ipa} - e^{-ipa}}{ip} \right] \\ &= \frac{2}{p\sqrt{2\pi}} \left[\frac{e^{ipa} - e^{-ipa}}{2i} \right] \\ &= \frac{2}{p\sqrt{2\pi}} (\sin pa) ; p \neq 0 \end{aligned}$$

By L'Hospital Rule:

$$\begin{aligned} f(p) &= \frac{2a \cos pa}{\sqrt{2\pi}} ; p=0 \\ &= \frac{2a}{\sqrt{2\pi}} \end{aligned}$$

$$\therefore F\{f(x)\} = f(p) = \begin{cases} \frac{2 \sin pa}{p\sqrt{2\pi}} & , p \neq 0 \\ \frac{2a}{\sqrt{2\pi}} & , p = 0 \end{cases}$$

$$F\{f(x)\} = f(p) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} e^{ipx} f(x) dx$$

$$\Rightarrow F^{-1} f(p) = f(x) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} e^{-ipx} f(p) dp$$

$$\Rightarrow f(x) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} e^{ipx} \frac{2 \sin pa}{p\sqrt{2\pi}} dp$$

$$\begin{aligned} \Rightarrow f(x) &= \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} (\cos px - i \sin px) \frac{2 \sin pa}{p\sqrt{2\pi}} dp \\ &= \frac{2}{2\pi} \int_{-\infty}^{\infty} \frac{\sin pa - \cos px}{p} dp - i \frac{2}{2\pi} \int_{-\infty}^{\infty} \frac{\sin pa - \sin px}{p} dp \\ &= \frac{1}{\pi} \int_{-\infty}^{\infty} \frac{\sin pa - \cos px}{p} dp - i \frac{1}{\pi} \int_{-\infty}^{\infty} \frac{\sin pa - \sin px}{p} dp \end{aligned}$$

(i) Comparing real part,

$$\frac{1}{\pi} \int_{-\infty}^{\infty} \frac{\sin pa \cos px}{p} dp = \begin{cases} 1, & |x| < a \\ 0, & |x| > a \end{cases}$$

$$\Rightarrow \int_{-\infty}^{\infty} \frac{\sin pa \cos px}{p} dp = \begin{cases} \pi, & |x| < a \\ 0, & |x| > a \end{cases}$$

(ii) put $p=1, x=0$

$$\int_{-\infty}^{\infty} \frac{\sin p(1) \cos 0}{p} dp = \pi$$

$$\Rightarrow 2 \int_0^{\infty} \frac{\sin p}{p} dp = \pi$$

$$\Rightarrow \boxed{\int_0^{\infty} \frac{\sin p}{p} dp = \frac{\pi}{2}}$$

(10) Solve the Integral equations

$$(i) \int_0^{\infty} f(x) \cos x dx = e^{-1}$$

(ii) show that $\int_0^{\infty} \frac{\cos \lambda x}{\lambda^2 + 1} d\lambda = \frac{\pi}{2} e^{-x}, x \geq 0$

Sol:

(i) Given Integral equation

$$\int_0^{\infty} f(x) \cos \lambda x dx = e^{-\lambda}$$

$$\Rightarrow \sqrt{\frac{2}{\pi}} \int_0^{\infty} f(x) \cos \lambda x = \sqrt{\frac{2}{\pi}} e^{-\lambda} = F_c(p)$$

By Inversion Formula for cosine Fourier transform

$$F(x) = \sqrt{\frac{2}{\pi}} \int_0^{\infty} F_c(p) \cos \lambda x d\lambda$$

$$= \sqrt{\frac{2}{\pi}} \int_0^{\infty} \sqrt{\frac{2}{\pi}} e^{-\lambda} \cos \lambda x d\lambda$$

$$= \sqrt{\frac{2}{\pi}} \sqrt{\frac{2}{\pi}} \int_0^{\infty} e^{-\lambda} \cos \lambda x d\lambda \quad \left[\because \int e^{ax} \cos bx dx = \frac{e^{ax}}{a^2 + b^2} (a \cos bx + b \sin bx) \right]$$

$$= \frac{2}{\pi} \left[\frac{e^{-\lambda}}{(-1)^2 + x^2} (-\cos \lambda x + x \sin \lambda x) \right]_0^{\infty}$$

$$= \frac{2}{\pi} \left[0 - \left(\frac{1}{1+x^2} (-1+0) \right) \right]$$

$$= \frac{2}{\pi} \left(\frac{1}{1+x^2} \right)$$

(ii) Given $\int_0^{\infty} \frac{1}{1+\lambda^2} \cos \lambda x d\lambda = \frac{\pi}{2} e^{-x}$

W.K.T $\int_0^{\infty} e^{-x} \cos \lambda x dx = \frac{1}{1+\lambda^2}$

$$\Rightarrow \sqrt{\frac{2}{\pi}} \int_0^{\infty} e^{-x} \cos \lambda x \, dx = \sqrt{\frac{2}{\pi}} \frac{1}{1+\lambda^2}$$

$$F\{f(x)\} = f(p) \Rightarrow F_c\{e^{-x}\} = \sqrt{\frac{2}{\pi}} \frac{1}{1+\lambda^2}$$

$$\Rightarrow f_c(p) = \sqrt{\frac{2}{\pi}} \frac{1}{1+\lambda^2}$$

By Inverse formula,

$$e^{-x} = \sqrt{\frac{2}{\pi}} \int_0^{\infty} f_c(p) \cos \lambda x \, d\lambda$$

$$\Rightarrow e^{-x} = \sqrt{\frac{2}{\pi}} \int_0^{\infty} \sqrt{\frac{2}{\pi}} \frac{1}{1+\lambda^2} \cos \lambda x \, d\lambda$$

$$\Rightarrow \boxed{\frac{\pi}{2} e^{-x} = \int_0^{\infty} \frac{1}{1+\lambda^2} \cos \lambda x \, d\lambda}$$



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Date :

Advanced Numerical Analysis.

- ① Fit the least square line $y = a + bx$ and $y(5)$ for the data

x	0	2	5	7
y	-1	5	12	20

Sol:

x_i	y_i	x_i^2	$x_i y_i$
0	-1	0	0
2	5	4	10
5	12	25	60
7	20	49	140
14	36	78	210

From the Table

$$n = 4 \quad \sum x_i = 14 \quad \sum y_i = 36 \quad \sum x_i^2 = 78 \quad \sum x_i y_i = 210$$

The Normal equations are:

$$na + b \sum_{i=1}^n x_i = \sum_{i=1}^n y_i$$

$$a \sum_{i=1}^n x_i + b \sum_{i=1}^n x_i^2 = \sum_{i=1}^n x_i y_i$$

$$\Rightarrow 4a + 14b = 36$$

$$\Rightarrow 14a + 78b = 210$$

$$\boxed{2a + 7b = 18} \rightarrow \textcircled{1}$$

$$\Rightarrow \boxed{7a + 39b = 105} \rightarrow \textcircled{2}$$

Solving $\textcircled{1}$ and $\textcircled{2}$

$$\textcircled{1} \times 7 \Rightarrow 14a + 49b = 126$$

$$\textcircled{2} \times 2 \Rightarrow 14a + 78b = 210$$

$$-29b = -84$$

$$\boxed{b = 2.8966}$$

From ①

$$2a + 7b = 18$$

$$\Rightarrow 2a + 7(2.8966) = 18$$

$$\Rightarrow 2a + 20.2762 = 18$$

$$\Rightarrow 2a = -2.2762$$

$$a = -1.1381$$

\therefore The least square line is

$$y = a + bx = (-1.1381) + (2.8966)x$$

$$y(5) = -1.1381 + (2.8966)5$$

$$= -1.1381 + 14.483$$

$$= 13.3449$$

② Fit the least square power function of the form $y = ax^b$ for the data

x_i	1	2	3	4
y_i	3	12	21	35

Sol: $y = ax^b$

$$\Rightarrow \log y = \log ax^b$$

$$\Rightarrow \log y = \log a + b \log x$$

$$y = A + Bx$$

Here $y = \log y$ $A = \log a$, $B = b$ $x = \log x$

x_i	y_i	$x_i = \log x_i$	$y_i = \log y_i$	x_i^2	$x_i y_i$
1	3	0	1.0986	0	0
2	12	0.6931	2.4849	0.4804	1.7223
3	21	1.0986	3.0445	1.2069	3.3447
4	35	1.3863	3.5553	1.9218	4.9287
10	71	3.1780	10.1833	3.6091	9.9957

From the Table

$$n = 4, \quad \sum x_i = 3.1780 \quad \sum y_i = 10.1833 \quad \sum x_i^2 = 3.6091$$

$$\sum x_i y_i = 9.9957$$

The normal equations are:

$$nA + B \sum x_i = \sum y_i$$

$$A \sum x_i + B \sum x_i^2 = \sum x_i y_i$$

$$\Rightarrow 4 \log_e a + b(3.1780) = 10.1833$$

$$\Rightarrow (3.1780)A + (3.6091)B = 9.9957 \quad \text{--- (2)}$$

$$4A + (3.1780)B = 10.1833 \quad \text{--- (1)}$$

~~4A~~ Solving (1) and (2)

$$\textcircled{1} \times 3.1780 \Rightarrow 12.712A + 10.0997B = 32.3625$$

$\textcircled{2} \times 4$

$$12.712A + 14.4364B = 39.9828$$

$$-4.3367B = -7.6203$$

$$B = \frac{7.6203}{4.3367} = 1.7572$$

$$\boxed{B = 1.7572}$$

From ① $4A + (3.1780)(1.7572) = 10.1833$

$$\Rightarrow 4A + 5.5844 = 10.1833$$

$$\Rightarrow 4A = 4.5989$$

$$A = \frac{4.5989}{4} = 1.1497$$

$$\Rightarrow \log_e a = 1.1497$$

$$\Rightarrow a = e^{1.1497} = 3.1573$$

$$\boxed{a = 3.1573}$$

The least square function is $y = ax^b$

$$\Rightarrow \log y = \log a + b \log x$$

$$\Rightarrow \log y = 1.1497 + \log_x (1.7572)$$

$$y = e^{(1.1497)} x^{(1.7572)}$$

$$\boxed{y = (3.1573)x^{1.7572}}$$

③ Using the table, find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = 1.1$

x	1.0	1.1	1.2	1.3	1.4	1.5	1.6
y	7.989	8.403	8.781	9.129	9.451	9.750	10.031

Sol:-

x	y	Δy	$\Delta^2 y$	$\Delta^3 y$	$\Delta^4 y$	$\Delta^5 y$	$\Delta^6 y$
1.0	7.989						
1.1	8.403	0.414					
1.2	8.781	0.378	-0.036	0.006			
1.3	9.129	0.348	-0.030	0.004	-0.002	0.001	
1.4	9.451	0.322	-0.026	0.003	-0.001	-0.001	-0.002
1.5	9.750	0.299	-0.023	0.005	-0.002		
1.6	10.031	0.281	-0.018				

Here $x_0 = 1.1$, $h = 1.1 - 1.0$
 $= 0.1$

By Newton's forward difference formula

$$\begin{aligned}
 \left(\frac{dy}{dx} \right)_{x=x_0} &= \frac{1}{h} \left[\Delta y_0 - \frac{1}{2} \Delta^2 y_0 + \frac{1}{3} \Delta^3 y_0 - \frac{1}{4} \Delta^4 y_0 + \frac{1}{5} \Delta^5 y_0 - \frac{1}{6} \Delta^6 y_0 + \dots \right] \\
 &= \frac{1}{0.1} \left[0.378 - \frac{1}{2} (0.030) + \frac{1}{3} (0.004) - \frac{1}{4} (-0.001) + \frac{1}{5} (-0.001) \right] \\
 &= 10 \left[0.378 - 0.015 + 0.0013 + 0.00025 - 0.0002 \right] \\
 &= 10 [0.39435] \\
 &= 3.9435
 \end{aligned}$$

$$\left(\frac{d^2 y}{dx^2} \right)_{x=x_0} = \frac{1}{h^2} \left[\Delta^2 y_0 - \Delta^3 y_0 + \frac{11}{12} \Delta^4 y_0 - \frac{5}{6} \Delta^5 y_0 + \frac{133}{180} \Delta^6 y_0 - \dots \right]$$

$$= \frac{1}{(0.1)^2} \left[-0.030 - 0.004 - \frac{11}{12} (0.001) + \frac{5}{6} (0.001) \right]$$

$$= 100 \left[-0.030 - 0.004 - 0.0009 + 0.008 \right]$$

$$= 100 \left[-0.0341 \right]$$

$$= -3.41$$

④ From the following table, find the values of $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$

at $x = 2.03$

x	1.96	1.98	2.00	2.02	2.04
y	0.7825	0.7739	0.7651	0.7563	0.7473

x	y	Δy	$\Delta^2 y$	$\Delta^3 y$	$\Delta^4 y$
1.96	0.7825	-0.0086	-0.0002	0.0002	-0.0004
1.98	0.7739	-0.0088	0	-0.0002	
2.00	0.7651	-0.0088	-0.0002		
2.02	0.7563	-0.0090			
2.04	0.7473				

$$x = 2.03$$

$$x_n = 2.04$$

$$h = 2.04 - 2.02$$

$$= 0.02$$

$$u = \frac{x - x_n}{h} = \frac{2.03 - 2.04}{0.02} = \frac{-0.01}{0.02} = -\frac{1}{2}$$

$$\Rightarrow \boxed{\frac{du}{dx} = \frac{1}{h}}$$

By Newton's backward difference formula

$$y(x) = y_n + u \nabla y_n + \frac{u(u+1)}{2!} \nabla^2 y_n + \frac{u(u+1)(u+2)}{3!} \nabla^3 y_n +$$

$$\frac{u(u+1)(u+2)(u+3)}{4!} \nabla^4 y_n + \dots$$

$$\Rightarrow y(x) = y_n + u \nabla y_n + \frac{u^2+u}{2!} \nabla^2 y_n + \frac{u^3+3u^2+2u}{6} \nabla^3 y_n + \frac{u^4+6u^3+11u^2+6u}{24} \nabla^4 y_n + \dots \rightarrow (1)$$

differentiate equation (1) w.r. to "x",

$$y'(x) = \frac{dy}{dx} = \left[0 + \nabla y_n + \frac{2u+1}{2} \nabla^2 y_n + \frac{3u^2+6u+2}{6} \nabla^3 y_n + \frac{4u^3+18u^2+22u+6}{24} \nabla^4 y_n \right] \frac{du}{dx}$$

$$= \frac{1}{h} \left[\nabla y_n + \frac{2u+1}{2} \nabla^2 y_n + \frac{3u^2+6u+2}{6} \nabla^3 y_n + \frac{4u^3+18u^2+22u+6}{24} \nabla^4 y_n \right] \rightarrow (2)$$

$$\begin{aligned} \Rightarrow y'(2.03) &= \frac{1}{0.02} \left[-0.009 + \frac{2(-\frac{1}{2})+1}{2} (-0.0002) + \frac{3(-\frac{1}{2})^2+6(-\frac{1}{2})+2}{6} (-0.0002) \right. \\ &\quad \left. + \frac{4(-\frac{1}{2})^3+18(-\frac{1}{2})^2+22(-\frac{1}{2})+6}{24} (-0.0004) \right] \\ &= 50 \cdot \left[\frac{-0.108}{12} + \frac{0.0001}{12} + \frac{0.0002}{12} \right] \\ &= -0.44875 \end{aligned}$$

differentiate equation (2) w.r. to "x",

$$\begin{aligned}
 y''(x) &= \frac{d^2 y}{dx^2} = \frac{1}{h^2} \left[\nabla^2 y_n + \nabla^3 y_n (u+1) + \frac{6u^2 + 18u + 11}{12} \nabla^4 y_n \right] \\
 &= \frac{1}{(0.02)^2} \left[-0.0002 + \left(1 - \frac{1}{2}\right) - 0.0002 + \left(\frac{6(-\frac{1}{2})^2 + 18(-\frac{1}{2}) + 11}{12} \right) (-0.0004) \right] \\
 &= 2500 \left[-0.0002 - 0.0001 + \frac{6(\frac{1}{4}) - 18(\frac{1}{2}) + 11}{12} (0.0004) \right] \\
 &= 2500 \left[-0.0002 - 0.0001 - \left(\frac{\frac{3}{2} - 9 + 11}{12} \right) (0.0004) \right] \\
 &= \underline{\underline{-1.4167}}
 \end{aligned}$$

⑤ Evaluate the Integral $\int_0^1 \frac{1}{1+x} dx$ by Trapezoidal Rule with $h=0.25$.

Sol:- Let $y = \frac{1}{1+x}$ and $h=0.25$

$$\Rightarrow \frac{0-1}{0.25} = n$$

$$\Rightarrow \boxed{n=4}$$

The value of $y = \frac{1}{1+x}$ are given below :

x	0	0.25	0.5	0.75	1
$y = \frac{1}{1+x}$	1	0.8	0.6667	0.5714	0.5

Here $y_0=1$; $y_1=0.8$; $y_2=0.6667$; $y_3=0.5714$; $y_4=0.5$

By Trapezoidal rule:

$$\begin{aligned}
 \int_0^1 \frac{1}{1+x} dx &= \frac{h}{2} \left[(y_0 + y_4) + 2(y_1 + y_2 + y_3) \right] \\
 &= \frac{0.25}{2} \left[(1 + 0.5) + 2(0.8 + 0.6667 + 0.5714) \right] \\
 &= 0.125 \left[1.5 + 2(2.0381) \right] \\
 \Rightarrow \int_0^1 \frac{1}{1+x} dx &= 0.125 \left[1.5 + 4.0762 \right]
 \end{aligned}$$

$$= 0.697025$$

$$\therefore \int_0^1 \frac{1}{1+x} dx = 0.697$$

- ⑥ Find the value of the integral $\int_0^1 \frac{1}{1+x^2} dx$ by using Simpson's $\frac{1}{3}$ and $\frac{3}{8}$ rule.

Sol:-

Divide the interval $[0, 1]$ into 6 equal sub-intervals of width $h = \frac{b-a}{n} = \frac{1-0}{6} = \frac{1}{6}$ then, The values of $y = f(x) = \frac{1}{1+x^2}$ at each points of sub-divisions are:

x	0	$\frac{1}{6}$	$\frac{2}{6}$	$\frac{3}{6}$	$\frac{4}{6}$	$\frac{5}{6}$	1
$y = \frac{1}{1+x^2}$	1.0000	0.9729	0.9000	0.8000	0.6923	0.5901	0.5000

Here $y_0 = 1.000$; $y_1 = 0.9729$ $y_2 = 0.9000$; $y_3 = 0.8000$

$y_4 = 0.6923$ $y_5 = 0.5901$ $y_6 = 0.5000$

By Simpson's $\frac{1}{3}$ Rule:

$$\begin{aligned}
 \int_0^1 \frac{1}{1+x^2} dx &= \frac{h}{3} \left[(y_0 + y_6) + 4(y_1 + y_3 + y_5) + 2(y_2 + y_4) \right] \\
 &= \frac{1}{6(3)} \left[(1.0 + 0.5) + 4(0.9729 + 0.80 + 0.5901) \right. \\
 &\quad \left. + 2(0.9 + 0.6923) \right] \\
 &= \frac{1}{18} (14.1366) \\
 &= 0.785366
 \end{aligned}$$

By Simpson's $\frac{3}{8}$ Rule:

$$\int_0^1 \frac{1}{1+x^2} dx = \frac{3h}{8} [(y_0 + y_6) + 3(y_1 + y_2 + y_4 + y_5) + 2y_3]$$

$$\Rightarrow \int_0^1 \frac{1}{1+x^2} dx = \frac{3}{6(8)} [(1+0.5) + 3(0.9729 + 0.9 + 0.6923 + 0.5901) + 2(0.8)]$$

$$= \frac{1}{16} [12.5659]$$

$$= 0.785368$$

⑦ Solve the system of equations $x+2y+z=4$, $2x-3y-z=-3$

$3x+y+2z=3$ by Gauss elimination method

Sol: Given equations are:

$$x+2y+z=4 \rightarrow \textcircled{1}$$

$$2x-3y-z=-3 \rightarrow \textcircled{2}$$

$$3x+y+2z=3 \rightarrow \textcircled{3}$$

Solving $\textcircled{1}$ and $\textcircled{2}$

$$\textcircled{1} \times 2 \Rightarrow 2x + 4y + 2z = 8$$

$$\begin{array}{r} 2x - 3y - z = -3 \\ - \quad (+) \quad (+) \quad (+) \end{array}$$

$$\hline 7y + 3z = 11 \rightarrow \textcircled{4}$$

Solving $\textcircled{2}$ and $\textcircled{3}$.

$$\textcircled{2} \times 3 \Rightarrow 6x - 9y - 3z = -9$$

$$\textcircled{3} \times 2 \Rightarrow 6x + 2y + 4z = 6$$

$$\hline -11y - 7z = -15$$

$$\boxed{11y + 7z = 15} \rightarrow \textcircled{5}$$

Solving $\textcircled{4}$ and $\textcircled{5}$

$$(4) \times 11 \Rightarrow 77y + 33z = 151$$

$$(5) \times 7 \Rightarrow 77y + 49z = 105$$

$$\begin{array}{r} 77y + 33z = 151 \\ - \quad 77y + 49z = 105 \\ \hline -16z = 46 \end{array}$$

$$z = -1$$

From equation (4)

$$11y + 7(-1) = 15$$

$$\Rightarrow 11y = 15 + 7 = 22$$

$$\Rightarrow y = 2$$

Sub y and z values in equation (1)

$$x + 2(2) + (-1) = 4 \quad \therefore x = 1, y = 2, z = -1$$

$$\rightarrow x + 4 - 1 = 4$$

$$x = 1$$

(8) Solve the system of equations $5x + 2y + z = 12$, $x + 4y + 2z = 15$, $x + 2y + 5z = 20$ by Gauss Jordan method

Sol

Given equations are:

$$5x + 2y + z = 12$$

$$x + 4y + 2z = 15$$

$$x + 2y + 5z = 20$$

$$\text{Here } A = \begin{bmatrix} 5 & 2 & 1 \\ 1 & 4 & 2 \\ 1 & 2 & 5 \end{bmatrix} \quad X = \begin{bmatrix} x \\ y \\ z \end{bmatrix} \quad B = \begin{bmatrix} 12 \\ 15 \\ 20 \end{bmatrix}$$

$$\text{Augmented matrix } [AB] = \begin{bmatrix} 5 & 2 & 1 & 12 \\ 1 & 4 & 2 & 15 \\ 1 & 2 & 5 & 20 \end{bmatrix} \begin{array}{l} R_2 \rightarrow 5R_2 - R_1 \\ R_3 \rightarrow 5R_3 - R_1 \end{array}$$

$$[AB] = \begin{bmatrix} 5 & 2 & 1 & 12 \\ 0 & 18 & 9 & 63 \\ 0 & 8 & 24 & 88 \end{bmatrix} \begin{array}{l} R_2 \rightarrow \frac{R_2}{9} \\ R_3 \rightarrow \frac{R_3}{8} \end{array}$$

$$= \begin{bmatrix} 5 & 2 & 1 & 12 \\ 0 & 2 & 1 & 7 \\ 0 & 1 & 3 & 11 \end{bmatrix} \begin{array}{l} R_1 \rightarrow R_1 - R_2 \\ R_3 \rightarrow 2R_3 - R_2 \end{array}$$

$$= \begin{bmatrix} 5 & 0 & 0 & 5 \\ 0 & 2 & 1 & 7 \\ 0 & 0 & 5 & 15 \end{bmatrix} \begin{array}{l} R_3 \rightarrow \frac{R_3}{5} \end{array}$$

$$= \begin{bmatrix} 5 & 0 & 0 & 5 \\ 0 & 2 & 1 & 7 \\ 0 & 0 & 1 & 3 \end{bmatrix} \begin{array}{l} R_2 \rightarrow R_2 - R_3 \end{array}$$

$$[AB] = \begin{bmatrix} 5 & 0 & 0 & 5 \\ 0 & 2 & 0 & 4 \\ 0 & 0 & 1 & 3 \end{bmatrix} \begin{array}{l} R_1 \rightarrow \frac{R_1}{5} \\ R_2 \rightarrow \frac{R_2}{2} \end{array}$$

$$= \begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & 1 & 3 \end{bmatrix}$$

$$\therefore x = \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix} \text{ i.e., } x=1, y=2, z=3$$

⑨ Solve the equations $3x+2y+4z=7$, $2x+y+z=7$,
 $x+3y+5z=2$ by Factorization method

Sol:- Given equations are

$$3x+2y+4z=7$$

$$2x+y+z=7$$

$$x+3y+5z=2$$

Here $A = \begin{bmatrix} 3 & 2 & 4 \\ 2 & 1 & 1 \\ 1 & 3 & 5 \end{bmatrix}$ $X = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$ $B = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$

Given equations can be arranged in the form $AX = B$

Now, $A = LU$

$$\Rightarrow \begin{bmatrix} 3 & 2 & 4 \\ 2 & 1 & 1 \\ 1 & 3 & 5 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ l_{21} & 1 & 0 \\ l_{31} & l_{32} & 1 \end{bmatrix} \begin{bmatrix} u_{11} & u_{12} & u_{13} \\ 0 & u_{22} & u_{23} \\ 0 & 0 & u_{33} \end{bmatrix}$$

$$\Rightarrow \begin{bmatrix} 3 & 2 & 4 \\ 2 & 1 & 1 \\ 1 & 3 & 5 \end{bmatrix} = \begin{bmatrix} u_{11} & u_{12} & u_{13} \\ l_{21}u_{11} & l_{21}u_{12} + u_{22} & l_{21}u_{13} + u_{23} \\ l_{31}u_{11} & l_{31}u_{12} + l_{32}u_{22} & l_{31}u_{13} + l_{32}u_{23} + u_{33} \end{bmatrix}$$

$$\boxed{u_{11} = 3} ; \boxed{u_{12} = 2} ; \boxed{u_{13} = 4}$$

$$l_{21}u_{11} = 2 ; \quad l_{21}u_{12} + u_{22} = 1 \quad l_{21}u_{13} + u_{23} = 1$$

$$\Rightarrow 3l_{21} = 2 \quad \frac{2}{3}(2) + u_{22} = 1 \quad \Rightarrow \frac{2}{3}(4) + u_{23} = 1$$

$$\Rightarrow \boxed{l_{21} = \frac{2}{3}} \quad \boxed{u_{22} = -\frac{1}{3}} \quad \boxed{u_{23} = -\frac{5}{3}}$$

$$l_{31}u_{11} = 1 ; \quad l_{31}u_{12} + l_{32}u_{22} = 3 ; \quad l_{31}u_{13} + l_{32}u_{23} + u_{33} = 5$$

$$\Rightarrow 3l_{31} = 1 \quad \Rightarrow \frac{1}{3}(2) + l_{32}\left(-\frac{1}{3}\right) = 3 \quad \Rightarrow \frac{1}{3}(4) + (-1)\left(-\frac{5}{3}\right) + u_{33} = 5$$

$$\boxed{l_{31} = \frac{1}{3}} \quad \Rightarrow -\frac{1}{3}l_{32} = 3 - \frac{2}{3} \quad \Rightarrow \frac{4 + 35}{3} + u_{33} = 5$$

$$\Rightarrow \boxed{l_{32} = -7} \quad \Rightarrow \boxed{u_{33} = -8}$$

$$\therefore L = \begin{bmatrix} 1 & 0 & 0 \\ \frac{2}{3} & 1 & 0 \\ \frac{1}{3} & -7 & 1 \end{bmatrix} \text{ and } U = \begin{bmatrix} 3 & 2 & 4 \\ 0 & -\frac{1}{3} & -\frac{5}{3} \\ 0 & 0 & -8 \end{bmatrix}$$

$$Ly = B$$

$$\Rightarrow \begin{bmatrix} 1 & 0 & 0 \\ \frac{2}{3} & 1 & 0 \\ \frac{1}{3} & -1 & 1 \end{bmatrix} \begin{bmatrix} y_1 \\ y_2 \\ y_3 \end{bmatrix} = \begin{bmatrix} 7 \\ 7 \\ 2 \end{bmatrix}$$

$$\Rightarrow \begin{bmatrix} y_1 \\ \frac{2}{3}y_1 + y_2 \\ \frac{1}{3}y_1 - y_2 + y_3 \end{bmatrix} = \begin{bmatrix} 7 \\ 7 \\ 2 \end{bmatrix}$$

$$\Rightarrow \boxed{y_1 = 7}$$

$$\frac{1}{3}y_1 - y_2 + y_3 = 2$$

$$\frac{2}{3}y_1 + y_2 = 7$$

$$\Rightarrow \frac{7}{3} - \frac{49}{3} + y_3 = 2$$

$$\Rightarrow \frac{14}{3} + y_2 = 7$$

$$\Rightarrow y_3 = 2 + \frac{42}{3} = \frac{48}{3}$$

$$\Rightarrow \boxed{y_2 = 7/3}$$

$$\Rightarrow \boxed{y_3 = 16}$$

$$Ux = y$$

$$\begin{bmatrix} 3 & 2 & 4 \\ 0 & -1/3 & -5/8 \\ 0 & 0 & -8 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} y_1 \\ y_2 \\ y_3 \end{bmatrix}$$

$$\begin{bmatrix} 3x_1 + 2x_2 + 4x_3 \\ -1/3x_2 - 5/8x_3 \\ -8x_3 \end{bmatrix} = \begin{bmatrix} 7 \\ 7/3 \\ 16 \end{bmatrix}$$

$$-8x_3 = 16^2$$

$$\boxed{x_3 = -2}$$

$$3x_1 + 2x_2 + 4x_3 = 7$$

$$\Rightarrow 3x_1 + 2(3) + 4(-2) = 7$$

$$\Rightarrow 3x_1 + 6 - 8 = 7$$

$$\Rightarrow \boxed{x = 3}$$

- (10) Solve the following equations by Gauss-Jacobi method
 $10x - y + z = 12$, $x - 10y + z = 12$, $x + y - 10z = 12$ correct to 3
 decimals

Sol

Given equations are $10x - y + z = 12$

$$x - 10y + z = 12$$

$$x + y - 10z = 12$$

The equations can be written as:

$$\left. \begin{aligned} x &= \frac{1}{10} (12 + y - z) \\ y &= \frac{1}{10} (x - z - 12) \\ z &= \frac{1}{10} (x + y - 12) \end{aligned} \right\} \rightarrow \textcircled{1}$$

Let's take the first approximation as:

$$x^{(1)} = 0, y^{(1)} = 0, z^{(1)} = 0$$

We obtain second approximation from $\textcircled{1}$

$$x^{(2)} = \frac{1}{10} (12 - y^{(1)} - z^{(1)}) = \frac{1}{10} (12 + 0 - 0) = \frac{12}{10} = 1.2$$

$$y^{(2)} = \frac{1}{10} (x^{(1)} - z^{(1)} - 12) = \frac{1}{10} (0 - 0 - 12) = \frac{-12}{10} = -1.2$$

$$z^{(2)} = \frac{1}{10} (x^{(1)} + y^{(1)} - 12) = \frac{1}{10} (0 + 0 - 12) = \frac{-12}{10} = -1.2$$

Now, Obtain third approximation from $\textcircled{1}$

$$x^{(3)} = \frac{1}{10} (12 + y^{(2)} + z^{(2)}) = \frac{1}{10} (12 - 1.2 + 1.2) = 1.2$$

$$y^{(3)} = \frac{1}{10} (x^{(2)} - z^{(2)} - 12) = \frac{1}{10} (1.2 - 1.2 - 1.2) = -1.2$$

$$z^{(3)} = \frac{1}{10} (x^{(2)} + y^{(2)} - 12) = \frac{1}{10} (1.2 - 1.2 - 1.2) = -1.2$$

The second and Third approximations are same

∴ The solution is $x=1.2$, $y=-1.2$, $z=-1.2$

(II) Solve the differential equation $\frac{dy}{dx} = x+y$, with $y(0)=1$
 $x \in (0,1]$ by Taylor series expression to obtain "y" for $x=0.1$

Sol:- Given differential equation is $\frac{dy}{dx} = x+y$

Initial condition is $y(0)=1 \Rightarrow y(x_0)=y_0$

i.e., $x_0=0$, $y_0=1$

Taylor series at $x=x_0$ is,

$$y(x) = y(x_0) + \frac{x-x_0}{1!} y'(x_0) + \frac{(x-x_0)^2}{2!} y''(x_0) + \frac{(x-x_0)^3}{3!} y'''(x_0) + \frac{(x-x_0)^4}{4!} y^{IV}(x_0) + \dots$$

$$y' = x+y$$

$$y'' = 1+y'$$

$$y''' = 0+y'' = y''$$

$$y^{IV} = y'''$$

$$\text{At } x_0=0, y_0=1 \Rightarrow y'=1$$

$$y'' = 1+1=2$$

$$y''' = 2$$

$$y^{IV} = 2$$

$$\begin{aligned} y(x) &= 1 + \frac{x-0}{1!} (1) + \frac{(x-0)^2}{2!} (2) + \frac{(x-0)^3}{3!} (2) + \frac{(x-0)^4}{4!} (2) \\ &= 1 + x + x^2 + \frac{x^3}{3} + \frac{x^4}{12} \end{aligned}$$

For $x=0.1$

$$y(0.1) = 1 + 0.1 + (0.1)^2 + \frac{(0.1)^3}{3} + \frac{(0.1)^4}{12}$$

$$= 1.11001 + 0.00033 + 0.00000433$$

$$= \underline{1.11034}$$

(12)

Solve $y' = y - x^2$, $y(0) = 1$ by picard's method upto the fourth approximation. Hence find the value of $y(0.1)$ $y(0.2)$

Sol

Given $y' = f(x, y) = y - x^2$

Initial condition is $y(0) = 1 \Rightarrow y(x_0) = y_0$

i.e., $x_0 = 0$ $y_0 = 1$

By picard's method,

$$y = y_0 + \int_{x_0}^x f(x, y) dx = 1 + \int_0^x (y - x^2) dx \quad \text{--- (1)}$$

First approximation:

put $y = 1$

$$\begin{aligned} y^{(1)} &= 1 + \int_0^x (1 - x^2) dx = 1 + \left[x - \frac{x^3}{3} \right]_0^x \\ &= 1 + x - \frac{x^3}{3} \end{aligned}$$

Second approximation:

$$\begin{aligned} y^{(2)} &= 1 + \int_0^x (y^{(1)} - x^2) dx = 1 + \int_0^x \left(1 + x - \frac{x^3}{3} - x^2 \right) dx \\ &= 1 + x + \frac{x^2}{2} - \frac{x^4}{12} - \frac{x^3}{3} \end{aligned}$$

Third approximation:

$$\begin{aligned}y^{(3)} &= 1 + \int_0^x \left(1 + x + \frac{x^2}{2} - \frac{x^4}{12} - \frac{x^3}{3} - x^2\right) dx \\&= 1 + \int_0^x \left(1 + x - \frac{x^2}{2} - \frac{x^4}{12} - \frac{x^3}{3}\right) dx \\&= 1 + x + \frac{x^2}{2} - \frac{x^3}{6} - \frac{x^4}{12} - \frac{x^5}{60}\end{aligned}$$

Fourth approximation:

$$\begin{aligned}y^{(4)} &= 1 + \int_0^x \left[1 + x + \frac{x^2}{2} - \frac{x^3}{6} - \frac{x^4}{12} - \frac{x^5}{60} - x^2\right] dx \\&= 1 + \int_0^x \left(1 + x - \frac{x^2}{2} - \frac{x^3}{6} - \frac{x^4}{12} - \frac{x^5}{60}\right) dx \\&= 1 + x + \frac{x^2}{2} - \frac{x^3}{6} - \frac{x^4}{24} - \frac{x^5}{60} - \frac{x^6}{360} \rightarrow \textcircled{2}\end{aligned}$$

Put $x=0.1$ in $\textcircled{2}$

$$\begin{aligned}y(0.1) &= 1 + 0.1 + \frac{(0.1)^2}{2} - \frac{(0.1)^3}{6} - \frac{(0.1)^4}{24} - \frac{(0.1)^5}{60} - \frac{(0.1)^6}{360} \\&= 1 + 0.1 + 0.005 - 0.0001666 - 0.00000416 \\&\quad - 0.000000166 - 0.00000000277 \\&= \underline{\underline{1.104829}}\end{aligned}$$

Put $x=0.2$ in $\textcircled{2}$

$$\begin{aligned}y(0.2) &= 1 + 0.2 + \frac{(0.2)^2}{2} - \frac{(0.2)^3}{6} - \frac{(0.2)^4}{24} - \frac{(0.2)^5}{60} - \frac{(0.2)^6}{360} \\&= 1 + 0.2 + 0.02 - 0.0013333 - 0.00006666 \\&\quad - 0.000005333 - 0.000000777 \\&= \underline{\underline{1.21859}}\end{aligned}$$

(13) Solve the equation $y' = x + y$ with $y_0 = 1$ by Runge Kutta rule from $x = 0$ to $x = 0.4$ with $h = 0.1$.

Sol:

Given that $\frac{dy}{dx} = y' = x + y$ i.e., $f(x, y) = x + y$

$$h = 0.1, x_0 = 0, y_0 = 1$$

$$y_1 = y_0 + k \text{ where } k = \frac{1}{6}(k_1 + 2k_2 + 2k_3 + k_4)$$

$$k_1 = h f(x_0, y_0) = 0.1(0 + 1) = 0.1$$

$$k_2 = h f\left(x_0 + \frac{h}{2}, y_0 + \frac{k_1}{2}\right) = 0.1(0.05 + 1.05)$$

$$= 0.11$$

$$k_3 = h f\left(x_0 + \frac{h}{2}, y_0 + \frac{k_2}{2}\right) = 0.1(0.05 + 1.055)$$

$$= 0.1105$$

$$k_4 = h f(x_0 + h, y_0 + k_3) = 0.1(0.1 + 1.1105)$$

$$= 0.12105$$

$$y_1 = y_{(x=0.1)} = 1 + \frac{1}{6}[0.1 + 0.22 + 0.2210 + 0.12105]$$

$$\boxed{y_1 = 1.11034}$$

$$y_2 = y_1 + k \text{ where } k = \frac{1}{6}(k_1 + 2k_2 + 2k_3 + k_4)$$

$$k_1 = h f(x_1, y_1) = 0.1[0.1 + 1.11034]$$

$$= 0.121034$$

$$k_2 = hf\left(x_1 + \frac{h}{2}, y_1 + \frac{k_1}{2}\right) = (0.1)(0.15 + 1.11034 + 0.060517)$$

$$= 0.13208$$

$$k_3 = hf\left[x_1 + \frac{h}{2}, y_1 + \frac{k_2}{2}\right]$$

$$= 0.1(0.15 + 1.11034 + 0.06604)$$

$$= 0.13208$$

$$k_4 = hf(x_1 + h, y_1 + k_3) = 0.1(0.20 + 1.11034 + 1.013263)$$

$$= 0.14263$$

$$y_2 = y_{(x=0.2)} = y_1 + \frac{1}{6}(k_1 + 2k_2 + 2k_3 + k_4)$$

$$= 1.11034 + \frac{1}{6}(0.121034 + 2(0.13208 + 0.13208) +$$

$$= 1.2428$$

$$0.14263)$$

$$\boxed{y_2 = 1.2428}$$

$$y_3 = y_2 + k \text{ where } k = \frac{1}{6}(k_1 + 2k_2 + 2k_3 + k_4)$$

$$k_1 = hf(x_2, y_2) = 0.1(0.2 + 1.2428) = 0.14428$$

$$k_2 = hf\left(x_2 + \frac{h}{2}, y_2 + \frac{k_1}{2}\right) = 0.1(0.25 + 1.2428 + 0.07214)$$

$$= 0.15649$$

$$k_3 = hf\left[x_2 + \frac{h}{2}, y_2 + \frac{k_2}{2}\right] = 0.1(0.25 + 1.2428 + 0.07824)$$

$$= 0.15110$$

$$k_4 = hf(x_2 + h, y_2 + k_3) = 0.1(0.3 + 1.2428 + 0.15110)$$

$$= 0.16999$$

$$y_3 = 1.2428 + \frac{1}{6} (0.14428 + 2(0.15699 + 0.15710) + 0.16997)$$

$$\Rightarrow \boxed{y_3 = 1.3997}$$

$$y_4 = y_3 + k \text{ where } k = \frac{1}{6} (k_1 + 2k_2 + 2k_3 + k_4)$$

$$k_1 = 0.1 (0.3 + 1.3997) = 0.16997$$

$$k_2 = 0.1 (0.35 + 1.3997 + 0.08949) = 0.18347$$

$$k_3 = 0.1 (0.35 + 1.3997 + 0.9170) = 0.18414$$

$$k_4 = 0.1 (0.4 + 1.3997 + 0.18414) = 0.19838$$

$$y_4 = 1.3997 + \frac{1}{6} [0.16997 + 2(0.18347 + 0.18414) + 0.19838]$$

$$\Rightarrow \boxed{y_4 = 1.5836}$$

(14) Using Euler's method compute $y(0.3)$ with $h=0.1$, from the following $y' = x - y$, $y(0) = 1$

Sol: Given $y' = \frac{dy}{dx} = x - y$ and $y(0) = 1 \Rightarrow y(x_0) = y_0$
i.e., $x_0 = 0$, $y_0 = 1$

$$h = 0.1$$

By Euler's method,

$$y_{n+1} = y_n + h f(x_n, y_n)$$

$$y_1 = y_0 + h f(x_0, y_0)$$

$$y_1 = y(0.1) = 1 + 0.1 f(0, 1) = 1 + 0.1 (0 + 1)$$

$$\Rightarrow \boxed{y_1 = 1.1}$$

$$y_2 = y(0.2) = y_1 + h f(x_1, y_1)$$

$$= 1.1 + 0.1 (0.1 + 1.1)$$

$$= 1.1 + 0.1 (1.2)$$

$$= 1.1 + 0.12 = 1.22$$

$$\boxed{y_2 = 1.22}$$

$$y_3 = y(0.3) = y_2 + h f(x_2, y_2)$$

$$= 1.22 + 0.1 (0.2 + 1.22) = 1.22 + 0.1 (1.42)$$

$$= 1.22 + 0.142 = 1.362$$

$$\boxed{y_3 = 1.362}$$

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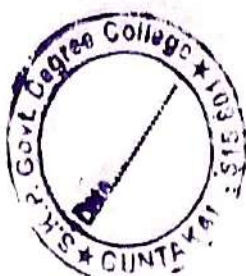
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190151170 submitted to faculty of Mathematics Department in partial fulfillment of the requirements for the award of Degree of Bachelor of Science in Mathematics from SKP Govt. Degree College, Guntakal.

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PROJECT WORK

ON

LAPLACE TRANSFORM

INTRODUCTION ABOUT PIERRE - SIMON LAPLACE



- * NAME :- Pierre Simon Laplace
- * BORN :- 23 March 1749, Beccancourt - en - Auge, Normandy, Kingdom of France.
- * DIED :- 5 March 1827 (aged 77), Paris, France Bourbon France.
- * NATIONALITY :- French
- * ALMA MATER :- University of Caen
- * KNOWN FOR :- Work in celestial Mechanics.
- * KNOWN FOR :- Predicting the Existence of black holes [1]
Bayesian inference
Bayesian

* KNOWN FOR :- Probability

Laplace's Equation

Laplacian

Laplace Transform

Inverse Laplace transform

Laplace

Distribution

Laplace's demon

Laplace Expansion

Young - Laplace Equation

Laplace Number

Laplace limit

Laplace invariant

Laplace principle

Laplace principle and sufficient

Laplace method

Laplace Expansion

Laplace Force

Laplace filter

Laplace functional

Laplacian Matrix

Hypothesis etc.,

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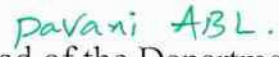


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DEPARTMENT OF MATHEMATICS

PROJECT WORK 2020-21



CERTIFICATE

This is to certify that the Project **“Integral Transform and Advanced Numerical Analysis”** is a bonafide work S. Suresh - III MPCS
190151172 submitted to faculty of Mathematics Department in Partially fulfillment of the requirements for the award of Degree of Bachelor of Science in Mathematics from SKP Govt. Degree College, Guntakal.


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E Health Care Management System

A Thesis

Submitted in partial fulfillment of the requirement

For the award of the degree in

Bachelor of Science

By

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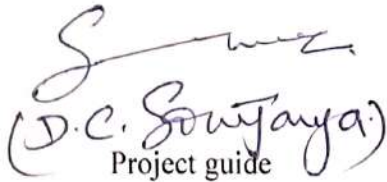
2022

SKP GOVT DEGREE COLLEGE::GUNTAKAL



CERTIFICATE

This is to certify that the project “E Health Care Management System” is a bonafied work of G.Vaishnavi,M.Hemanth Kalyan,M.Prudhvi Sai,S.Mahaboob,T.Pavan Kalyan,SMD.Fayaz submitted to the faculty of computer department in partially fulfillment of the requirements for the award of degree of bachelor of science in Computer Science from SKP(gdc)guntakal.


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1. INTRODUCTION

This project deals with the Corporate Medicare Management. This project is very helpful to both Medicare staff as well as to the public. It is having mainly Administration and Client modules.

The growing quality demand in the hospital sector makes it necessary to exploit the whole potential of stored data efficiently, not only the clinical data, in order to improve diagnoses and treatments, but also on management, in order to minimize costs and improve the care given to the patients.

In this sense, Data Mining (DM) can contribute with important benefits to the health sector, as a fundamental tool to analyze the data gathered by hospital information systems (HIS) and obtain models and patterns which can improve patient assistance and a better use of resources and pharmaceutical expense.

Data Mining is the fundamental stage inside the process of extraction of useful and comprehensible knowledge, previously unknown, from large quantities of data stored in different formats, with the objective of improving the decisions of companies, organizations or institutions where the data have been gathered.

However, data mining and the overall process, known as Knowledge Discovery from Databases (KDD), is usually an expensive process, especially in the stages of business objectives elicitation, data mining objectives elicitation, and data preparation. This is especially the case each time data mining is applied to a hospital: many meetings have to be held with the direction of the hospital, area coordinators, computer scientists, etc., to establish the objectives, prepare the data, the mining views and for training the users to general DM tools.

1.1 PURPOSE

In Medicare management situations we are dealing with Data Mining objectives such as:

1. To optimize bed occupation.
2. To improve the use of operating theatres, avoiding the cancellation of operations.
3. To know how emergencies affect to the administration of the hospital departments or services (cancellation of operations, etc).
4. To optimize the allocation of human and material resources towards and shifts.
5. To detect the influence of certain diseases in the hospital's services.
6. To find clusters of patients.

1.2 SCOPE

1.2.1 Existing System Features

- Integration of Corporate Medicare centers is very difficult while it is having different branches.
- In most of the cases the database is similar from one hospital to another hospital. In those cases also we can't easily adapt a new technology in the new hospital.
- It is very difficult to analyze the usage percentage of hospital resources, Bed occupation Ratio, Administration, Laboratory information even in a single center. Then we can expect the complexity while integrating multi multi-specialty Medicare Centers.
- Room Reservations, Doctor Appointment Schedules, Operation Schedules, and Medicine indentation information is very difficult to maintain and share among the different Medicare Centers.
- Lack of generic and unique model we have to implement the same set of data model for every newly established Medicare Center.

1.2.2 Proposed System Features

In this project we are trying to implement which parts of a data-mining project for hospital management are equal or highly similar across different hospitals (at least in the same national healthcare system). This allows us to design several data mining modules, which can be portable across several hospitals, thus dramatically reducing the time to implement a data-mining program in a new hospital.

1.3 Structure of Automated Tool for Medicare

CRISP-DM (Standard Cross-Industry Process for Data Mining), is a consortium of companies (initially granted by the European Commission) which has defined and validated a data mining process that is applicable to several industry sectors. The following Figure 1 shows the different stages of this process:

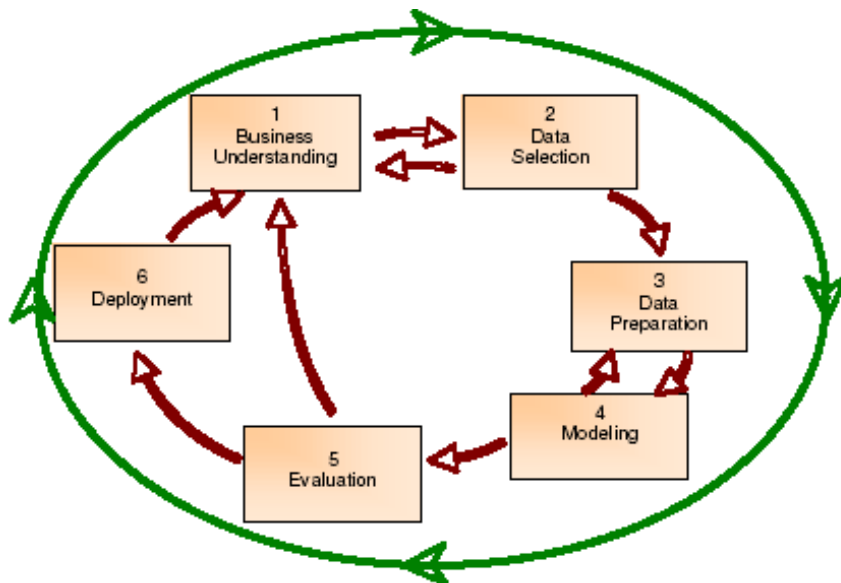


Figure 1: Life cycle of a data mining project.

The initial stage (Business Understanding) focuses on identifying the problems we are trying to solve through DM (i.e., the business objectives are defined). In our area of interest (healthcare), some hospital management objectives might be: to improve the use of hospital resources, to avoid bed occupation greater than 100% or to plan the schedule for using the

operating theatre more intensively. These objectives are defined by the people in charge of the hospital management, and then they have to be converted into data mining objectives.

For instance, some data mining objectives defined from the business objectives mentioned above are: to obtain a predictive model of hospital bed occupation, to predict the stay time of a patient depending on their disease, to establish models for estimating operations with higher cancellation or delay probability, etc. Objectives like these are of general interest for improving the management of any hospital independently of whether it is a general or a specialized health centre.

So these objectives could be included as an initial set of generic objectives in an automated data mining tool specially developed for this area. Something similar occurs with respect to the data that could be relevant for the hospital management: they are usually gathered for every centre. For instance, admission date, admission cause, discharge data, medical service assigned at the admission time, etc.

The main difference between hospitals is the format in which this information is stored in the DBMS. This fact makes it possible to (semi-)automate the rest of the life cycle stages. Hence, for stage 2, we only need to characterize the data load process from the particular HIS to the data warehouse (D.W.) for collecting all data needed for the data mining process. Likewise, regarding the data preparation stage, the same transformation processes (construction of new attributes, grouping continuous data in ranges, etc...) will be applicable for any HIS since all of them work with the same kind of data.

In general, stages 4 to 6 can also be done in an automated way since those generated models which are of interest for a hospital probably are also of interest for another one, and so on.

1.4 Data mining Tool for Hospital Management

Taken all of these considerations into account, we propose the following general scheme for an automated data mining tool for hospital management (Figure 2).

The tool is composed by several processes (modules) that correspond to the stages described in Figure 2. Thus, the load process corresponds to stages 2 and 3 (as we have discussed before).

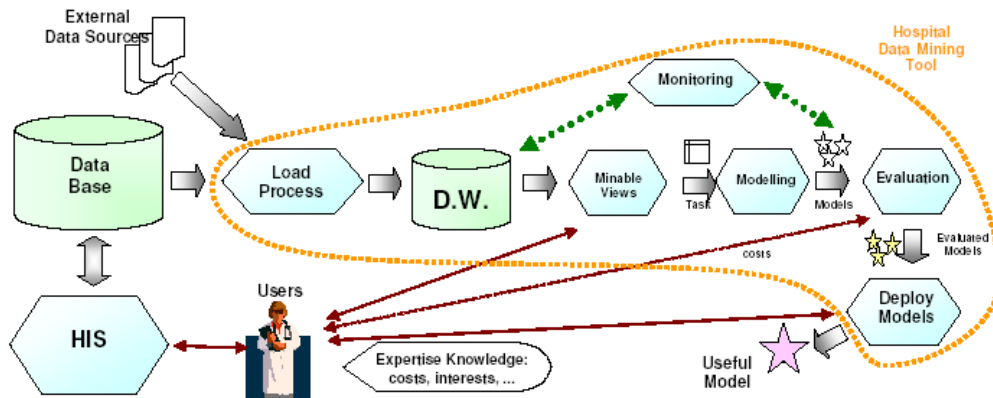


Figure 2: Data Mining Tool for Hospital Management.

The Minable View process integrates the business objectives in order to select from the D.W. the data to be used for constructing the models. Finally, the following processes (Modeling, Evaluation and Deploy Models) represent stages 4, 5 and 6, respectively.

1.5 Transforming Objectives into DM Objectives

Most of these objectives are related to emergency hospitalizations since it is a special service whose medical treatments and procedures cannot be usually delayed. Also, these objectives are interrelated. For example, if the bed occupation is closer 100%, it is necessary to cancel operations previously planned. If the operations are frequently cancelled, then the waiting lists are increased.

Now, the previous objectives have to be transformed into Data Mining objectives, such as:

1. To carry out global models about pressure emergencies by different time periods (daily, by shifts of work, by day of the week, etc).
2. To generate a model for predicting the number of daily hospitalizations coming from emergencies.
3. To obtain predictive models of global and partial use of beds by hospital service.
4. To construct models for estimating how the resources of a hospital are affected by a certain disease (for instance, influenza).
5. To carry out models to cluster patients (by age, by area, by pathology class, etc).

1.5.1 Data Integration

For solving the data mining objectives, we need two kinds of information: internal (contained in the HIS) and external (not contained in the HIS). Internal information changes from one hospital to another, but for example, all of them collect general data from patients and their treatments. External data are not easy to obtain, because they are not gathered in any database.

In the area we're focusing on in this project, emergencies, we implemented the following integration:

- For internal data, our system gathers the personal patient details which are usually present in any hospital, sex, birthday date, country and living area. It is also fed by information about the patient workflow: admission date and time, reason of admission, discharge date and time, discharge code from emergencies, code of the medical service assigned at the admission time, initial diagnosis, final diagnosis, etc.
- For the external data, we gather the following data (different for each hospital, since this is geographically dependent): meteorological data (temperature, quantity of rain, wind speed, etc), lunar stage, character of the day (holiday, before holiday or after holiday, and also the festivals in the city, etc., important events, for example, football matches).

1.5.2 Data Preparation

One of the main problems to apply data mining for improving the management of a hospital is the bad quality of the source data. In many cases, the collected data contain missing or anomalous values. This can be due to a wide range of reasons: many patients do not have enough time (or they are not conscious) for filling the admission form patients do not have documents when they arrive at the hospital, illegible data, bad transcriptions, repetition of values, etc. Therefore, in these contexts, a thorough data preparation stage is very important for a successful data mining process. Some processes in the data extraction phase have been adapted to particular hospitals, but many other data cleansing/preparation processes (detection of missing or anomalous values, attribute transformation, feature creation, etc.) are the same across hospitals.

On the other hand, in many cases we will find attributes containing text, for instance, an initial description of the pathology of the patient. Since this kind of attributes cannot be directly dealt with classical learning methods, we could employ retrieval information techniques to transform the text attributes in one or more discrete attributes. For instance, we could transform the attribute with the initial description of the patient's pathology into a discrete attribute with a value for the most common pathologies (flu, traumatisms...), and a value "unclassified" for the rest of cases.

Part of this preparation stage is reused from hospital to hospital, through the automation of all these processes in a data preparation module.

We implemented scripts for extracting data from the different hospitals into the Data Warehouse (DW). These scripts must be slightly different from hospital to hospital. From the DW, since the data definition (multidimensional schema) is the same for every hospital, we used SQL scripts to generate the minable views, which are exactly the same. For instance, the minable view for the emergency pressure must integrate the number of admissions per day (or per shift) and calculate means for admission numbers of the previous week. Additionally, the number of nonworking days before and after must be computed in order to get the attributes for the minable

view. All these complex SQL queries are highly time-consuming. With our approach, these complex queries are 100% portable from one hospital DW to another, and all this effort is reused.

From the minable views, the data is converted into a standard format (the arff format of WEKA) by means of Python scripts. In this way, using the command-line option in WEKA, we can generate, evaluate and export the models. Then the models are applied to new data. All this process is automated. Additionally, in some cases, the predictions can be integrated into the HIS.

1.5.3 Learning the Models

Once the data have been properly filtered, cleaned and transformed, we can proceed with the induction of the prediction models. For this purpose, we employ the suite WEKA and we make our modules work with it. This suite integrates many of the most known learning techniques, as well as, several pre-processing and post-processing tools. Additionally, WEKA has been released as open source, so, if it is required, we can adapt this software for our particular requirements

The key point for using WEKA is the proper construction of the minable view in such a way that could be directly used by the learning methods. A standard format (arff) has been defined as a data and model file repository in WEKA. So, the idea is to generate the data in this format, and in this way we can employ all the different leaning techniques integrated in this suite.

2. SYSTEM ANALYSIS

2.1 Requirement Analysis

A requirement is a feature that must be included in the system. Before the actual design and implementation start, getting to know the system to be implemented is of prime importance.

Main emphasis should be on:

- Inputs enter into the system.
- Standard Encryption of Input on submit
- The outputs expected from the system.
- The people involved in the working of the system.
- The volume of DATA (INPUT) and the amount of Information (OUTPUT) that will be involved with respect to the system itself, the following facts should be taking into consideration.

The Major process involved:

- The main points of the application.
- The processing rules for the collected data.
- The exceptions that may be present.
- That checks that should be in place in order to avoid wrong entries.

2.1.1 Software Requirement Specification

OPERATING SYSTEM	:	WIN 98/2000/XP, UNIX/LINUX
DATA BASE	:	ORACLE
SOFTWARE	:	APACHE TOMCAT
FRONT END TOOL	:	DHTML
LANGUAGE	:	JAVA

SCRIPTING LANGUAGE : JAVA SCRIPT
WEB COMPONENTS : SERVLETS, JSP
DATA MINING TOOL : WEKA

2.1.2 Hardware Requirements Specification

PROCESSOR : Pentium-IV
PROCESSOR SPEED : 2.4GHZ
MONITOR : COLOR MONITOR
HARD DISK : 40GB
RAM : 512MB
MOUSE : SCROLLING MOUSE
KEY BOARD : MM KEY BOARD

2.1.3 Communication protocols

- TCP/IP protocol should be installed.
- Any browser should be installed (Internet explorer 6.0 or Netscape navigator 8.0)
- HTTP 1.1 should be present on the system.
- Internet connection should be present in order to access the site.
- Internal modem or NIC card should be present.

2.2 Requirement study

The origin of most software systems is in the need of a client, who either wants to automate an existing manual system or desires a new software system. The software system itself is created by the developer finally the completed system will be used by the end user. Thus, there are three major parties interested in a new system: the client, the users, and the developer. The requirements for the system that will satisfy the need of the clients and the concerns of the user have to communicate to the developer.

The problem is that the client usually does not understand software or the software development process, and the developer often does not understand the client's problem and application area. This causes a communication gap between the parties involved in the development project. A basic purpose of software requirement specification is to bridge this communication gap. SRS is the medium through which the client and the user need are accurately specified; indeed SRS forms the basis of software development. A good SRS should satisfy all the parties—something very hard to achieve and involves trade-offs and persuasion.

2.2.1 The Requirement Process:

The main reason of modeling generally focuses on the problem structure, not its external behaviors. Consequently, things like user interfaces are rarely modeled, whereas they frequently form a major component of the SRS.

Similarly performance constraints, design constraints, standards compliance, recovery, etc. are specified clearly in the SRS because the designer must know about them to properly design the system.

To properly satisfy the basic goals, an SRS should have certain properties and should contain different types of req. A good SRS is [IEEE87, IEEE94]: complete if everything the software is supposed to do and responses to the software to all classes of input data are specified in the SRS.

Correctness and completeness go hand in hand an SRS is unambiguous if and only if every requirement stated has one and only one interpretation, requirements often written in natural language.

An SRS is verifiable if and only if every stated requirement is verifiable. A requirement is verifiable if there exists some cost-effective process that can check whether the final software meets those requirements. An SRS is consistent if there is no requirements that with another.

Writing and SRS is an iterative process. Even when requirement of system are specified they are later modified as the need of the client change. Hence an SRS should be easy to modify. An SRS is traceable if the origin of each of its requirements is clear and if it facilitates the referencing of each requirement in future development [EEE87].

One of the most common problems in requirement specification is when some of the requirements of the client are not specified. This necessitates addition and modifications to the requirements later in the development cycle, which are often expensive to incorporate.

2.2.2 Project Schedule Study phase:

In the study phase we do the preliminary investigation and determine the system requirements. We study the system and collect the data to draw the dataflow diagrams. We follow the methods like questions and observation to find the facts that are involved in the process. This is an important because if the specification study is not done properly then design phase etc will go wrongly.

2.2.3 Design Phase:

In this design phase we design the system making use of study phase and the data flow diagrams. We make use the general access for designing.

We consider the top down approach. In the design phase we determine the entities and their attributes and the relationships between the entities. We do both logical and physical design of the system.

2.2.4 Development Phase:

In the development phase we mostly do the coding part following the design of the system. We follow modular programming for development and after development and after developing each and every module we do the unit testing followed by the integration testing.

2.2.5 Implementation Phase:

The last phase of the project is the implementation phase. Quality assurance is the primary motive in this phase. The quality assurance is the review of software products and related documentation for completeness, correctness, reliability and maintainability. The philosophy behind the testing is it finds errors. The testing strategies are of two types, the code testing and the specifications testing. In the code testing we are examining the logic of the program. On the surface, code testing seems to be ideal methods for testing software, but no tall software errors are uncovered.

2.3 Feasibility Study

Feasibility is an important phase in software development process. It enables the developers to have an assessment of the product being developed. It refers to the feasibility study of product in terms of outcomes of the product, operational use and technical support required for implementation it.

Feasibility study should be performed on the basis of various criteria and parameters. The various feasibility studies are:

1. Economic Feasibility
2. Operational Feasibility
3. Technical Feasibility

2.3.1Economic Feasibility

It refers to the benefits or outcomes we are deriving from the product as compared to the total cost we are spending for developing the product.

In the present system, the development of new product greatly enhances the accuracy of the system and reduces the delay in the processing of applications and generating the reports. The errors can be greatly reduced and at the same time providing the great level of security. Here we don't need additional equipment except memory of required capacity. No need for spending money on client for maintenance because the database used is web enabled database.

2.3.2 Operational Feasibility

It refers to the feasibility of the product to be operational. Some products may work very well at design and implementation but may fail in the real time environment. It includes the study of human required and their technical expertise.

In the present system, the entering the details, updating the details and reports generations are perfect and quick in operations.

2.3.3 Technical Feasibility

It refers to whether the software that is available in the market fully supports the present application .It studies the pros and cons of using particular software for the development and its feasibility. It also studies the additional time needed to be given to people to make the application work.

In the present system the user interface is user friendly and does not require much expertise and training .It just needs mouse click to do operations and to generate reports. The software that is used for developing is highly suitable for the present applications since the users require fast access to the web pages with a high degree of security. This is achieved through integration of web server and database server in the same environment.

3. LITERATURE SURVEY

Data mining research currently faces two great challenges: how to embrace data mining services with just-in-time and autonomous properties and how to mine distributed and privacy-protected data. To address these problems, the authors adopt the Business Process Execution Language for Web Services in a **service oriented distributed data mining (DDM)** platform to choreograph DDM component services and fulfill global data mining requirements. They also use the learning-from-illustrate how localized autonomy on privacy-policy enforcement plus a bidding process can help the service-oriented system self-organize.

Most data mining algorithms assume that data analysts will aggregate data extracted from production systems at a server for subsequent computationally intensive data-crunching processes. However, issues such as data privacy concerns (with respect to customer information stored in bank servers, for example) and limits on data transmission bandwidth (affecting terabytes of scientific data generated from remote lab instruments or supercomputers) demonstrate that aggregating data for centralized mining simply isn't possible in a growing number of cases.

Instead, it's become necessary to develop methodologies for mining distributed data that must remain private.¹ In addition, being able to get the right information at the right time (with respect to real-time business intelligence, for example) is an important business strategy in today's highly dynamic market.

This real-time objective imposes additional requirements on distributed data mining (DDM), including providing on-demand and self-adaptive services so that companies can cope with heterogeneities in data sources, with respect to data privacy requirements, which aren't always known in advance. We can address these challenges in two ways: a distributed computing architecture can support seamless provision, integration, and coordination of just-in-time and autonomous data mining services and a privacy-conscious DDM methodology can work on top of this architecture.

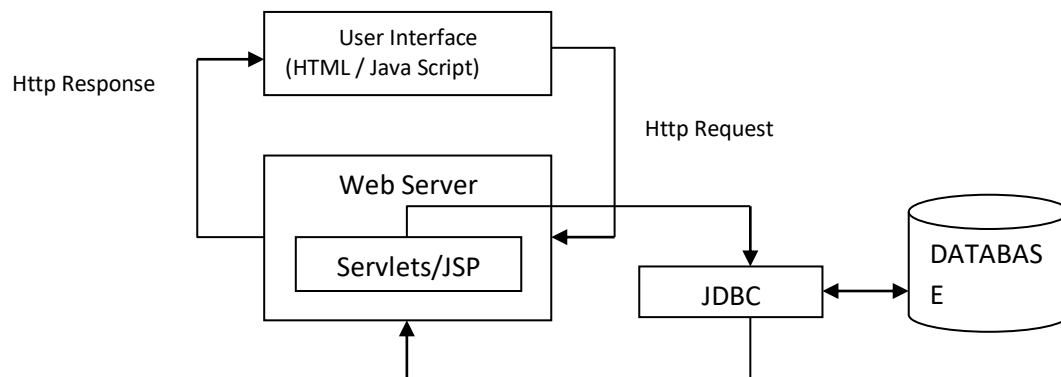
4. SYSTEM DESIGN

System design is the process, which involves conceiving planning and carrying out the plan by generating the necessary reports and inputs. In other words design phase acts as bridge between the software requirement specification and implementation phase, which satisfies those requirements. System design is the transformation of the analysis model into a system design model. The design of the system is correct if a system built precisely according to the requirements of that system. Design should be clearly verifiable, complete and traceable. The goal is to divide the problem into manageably small modules that can be solving separately. The different modules have to cooperate and communicate together to solve the problem. The complete project is broken down into different identifiable modules. Each module can be understood separately. All the modules at last are combined to get the solution of the complete system.

4.1 Model View Controller Architecture

MVC Architecture defines that the controller is separated from the system model and View. It is composed of three different layers. Being a Web based architecture. The user Interface is completely separated from the entire Business Logic Layer. The Database Layer and Business Logic Layer runs on the server Machine and the User Interface Layer will run under the Client Machine. For developing the User Interface we are having HTML and Java Script. For Business Login and Database Connectivity Servlets and JSP are used. In the Backed the servlets and Jsp's are connected to database through JDBC API. The web server plays a major role in connecting the client user interface and the servlets and JSP

Figure 3: Block Diagram of Architecture



4.2 Unified Modeling Language Diagrams

- The unified modeling language allows the software engineer to express an analysis model using the modeling notation that is governed by a set of syntactic semantic and pragmatic rules.
- A UML system is represented using five different views that describe the system from distinctly different perspective. Each view is defined by a set of diagram, which is as follows.

Structural model view

- In this model the data and functionality are arrived from inside the system.
- This model view models the static structures.

Behavioral Model View

- It represents the dynamic of behavioral as parts of the system, depicting the interactions of collection between various structural elements described in the user model and structural model view.

Implementation Model View

- In the structural and behavioral as parts of the system are represented as they are to be built.

Environmental Model View

- In this structural and behavioral aspects of the environment in which the system is to be implemented are represented.

UML is specifically constructed through two different domains they are

- UML Analysis modeling, this focuses on the user model and structural model views of the system.
- UML design modeling, which focuses on the behavioral modeling, implementation modeling and environmental model views.

4.3 Diagrams

4.3.1 Use case Diagrams

Use case Diagrams represent the functionality of the system from a user's point of view. Use cases are used during requirements elicitation and analysis to represent the functionality of the system. Use cases focus on the behavior of the system from external point of view.

Actors are external entities that interact with the system. Examples of actors include users like administrator, bank customer ...etc., or another system like central database

4.3.2 Class Diagrams

Class diagrams are widely used to describe the types of objects in a system and their relationships. These model the class structure and contents using elements such as classes, packages and objects. Class diagrams describe three different perspectives when designing a system. Conceptual, specification and implementation.

4.3.3 Interaction Diagrams

Sequence diagrams and Collaboration diagrams both are called as interaction diagrams. These are two of the five diagrams used in the UML for modeling the dynamic aspects of the systems. An interaction diagrams shows an interaction, consisting of a set of objects and their relationships, including the messages that may be dispatched among them.

4.3.4 Sequence Diagrams

A sequence diagram shows, as parallel vertical lines (“life lines”), different processes or objects that live simultaneously and horizontal arrows, the messages exchanged between them, in the order in which they occur. This allows the specification of simple runtime scenarios in a graphical manner.

4.3.5 Collaboration Diagrams

A collaboration diagram emphasizes the organization of the objects that participate in an interaction. There are two distinguish features from sequence diagram to represent, first, there is the path to indicate how one object is linked to other and second is sequence number, to indicate the time order of messages by prefix with number.

To illustrate the concept of autonomous DDM, we performed an experiment using GMM as the global model to demonstrate how to reach the optimal trade-off between the overall data mining quality and the local source’s data granularity levels via self-organization. Instead of assuming that the privacy-control component is passive, we implemented the local data sources with the autonomous property to negotiate with the global broker service regarding which data abstraction level to present.

The global broker first requests a data abstraction with coarse granularity from each local source. Then, it actively requests more specific details from those sources on a need-to-know basis so that it can learn the global model in a cost-effective manner.

The global brokering service can send the local sources the global model learned up to a specific moment, for example, and the local sources can then return their bid values computed based on the local data likelihood (defined as the product of the probabilities of generating the data) gained per unit cost by advancing one more level of granularity at the local sources. The global service will ask for more data details from the source with the highest value returned. This protocol continues until the data likelihood stops improving significantly or the computational budget runs out.

Use case Diagram for Admin



Figure 4: Use case for admin

Use case Diagram for Patient

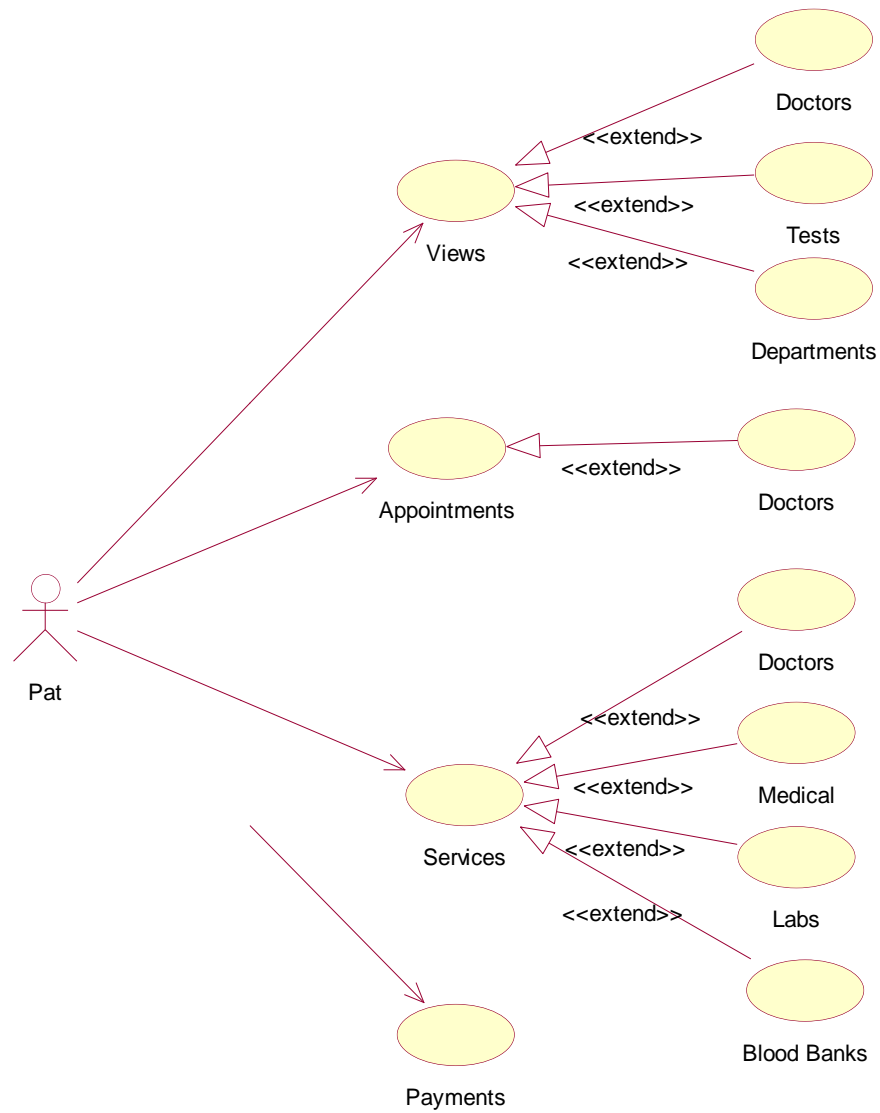


Figure 5: Use case for Patient

Use case Diagram for Patient

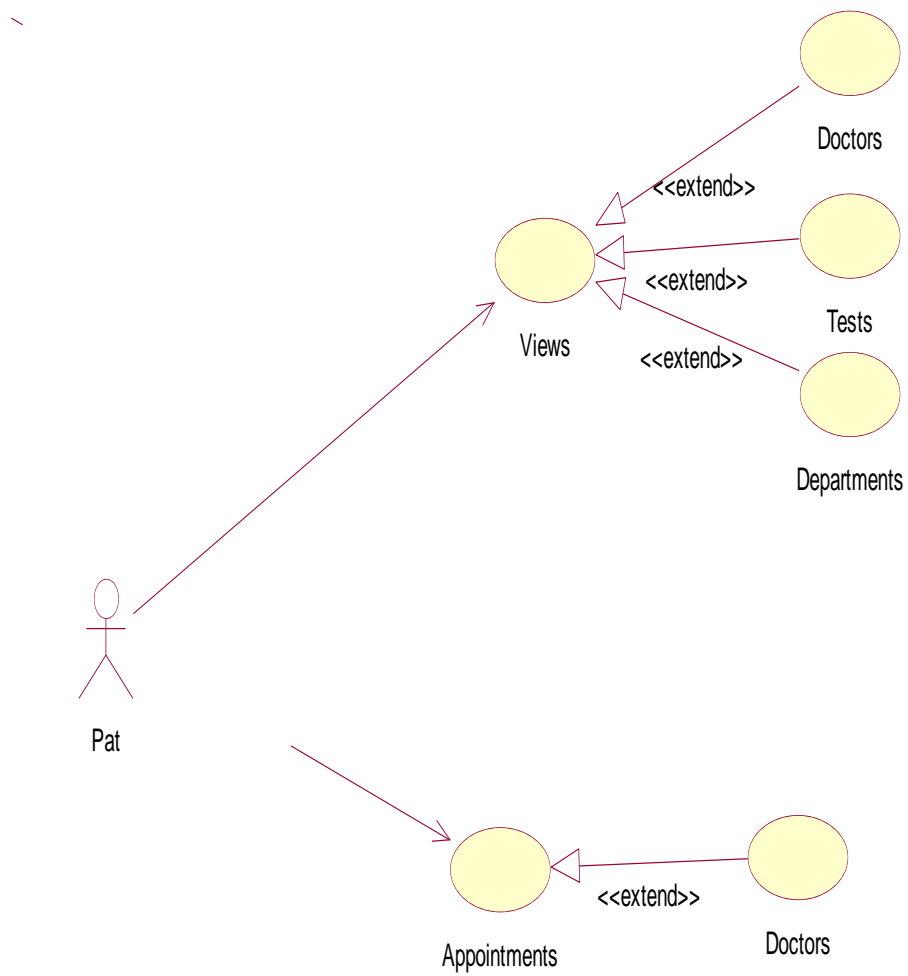


Figure 6: Use case for Public

Class Diagram for Medicare

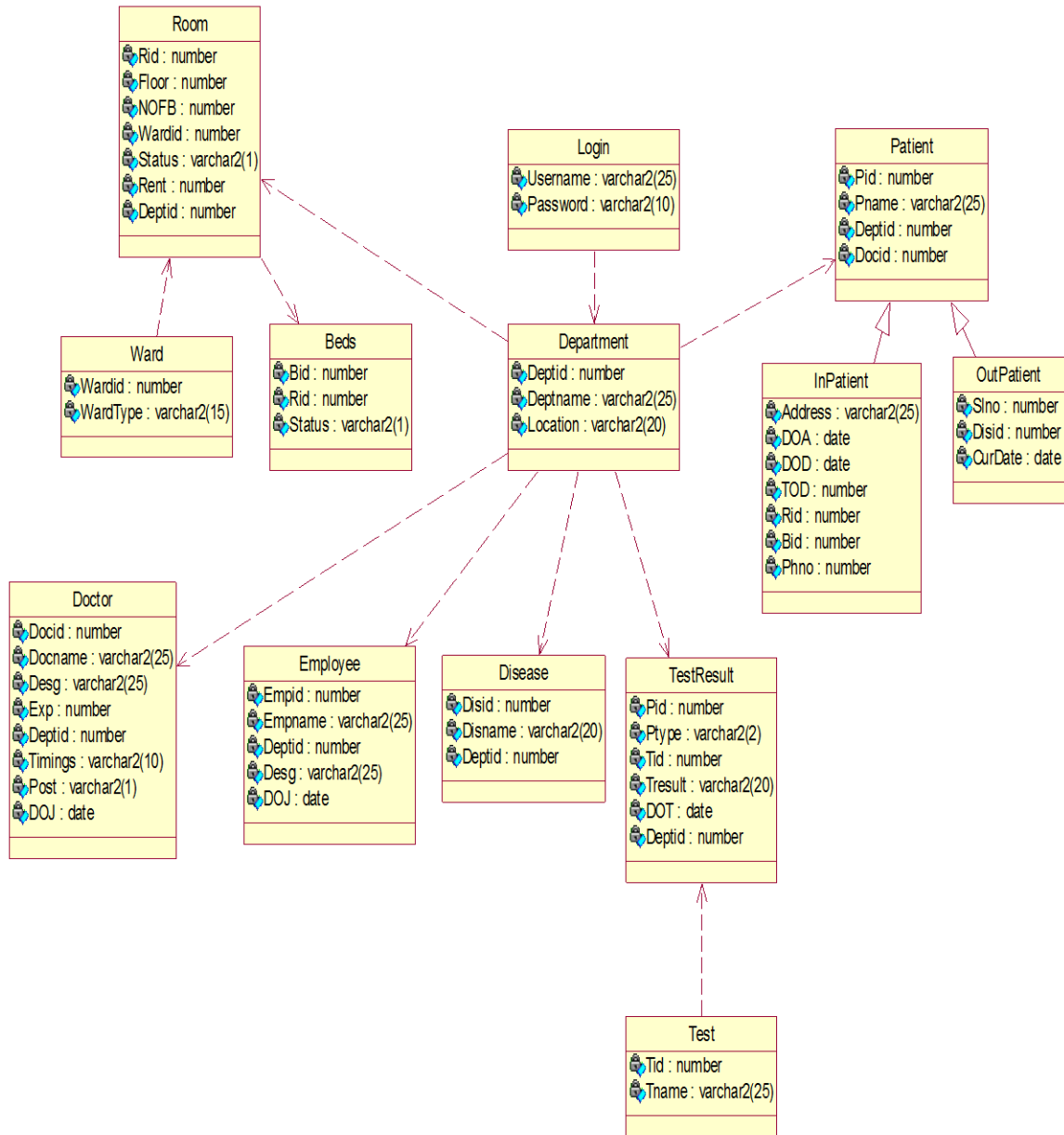


Figure 7: Class Diagram for Medicare

Sequence Diagram for Admin

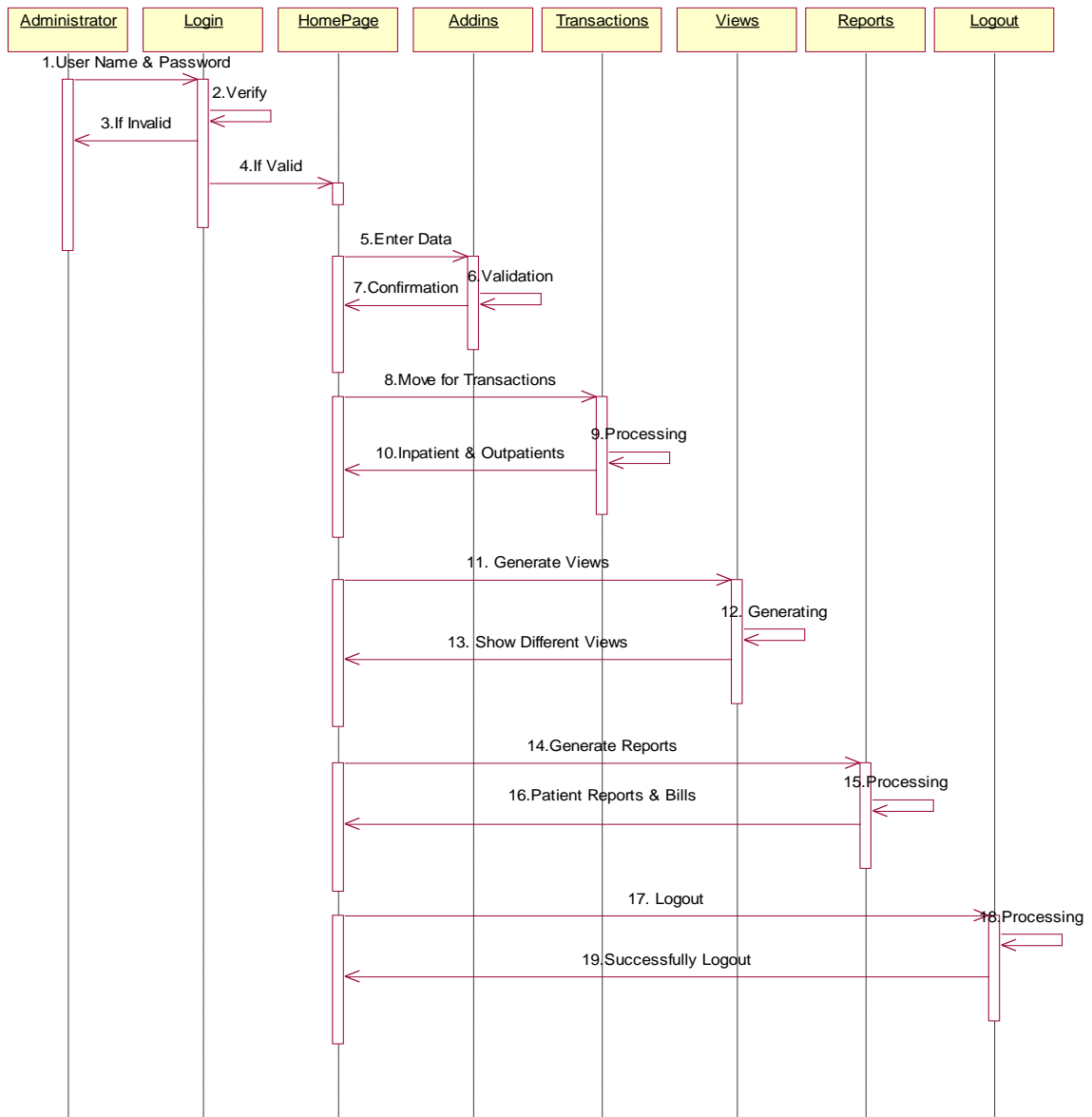


Figure: 8 Sequence Diagram for Admin

Sequence Diagram for patient

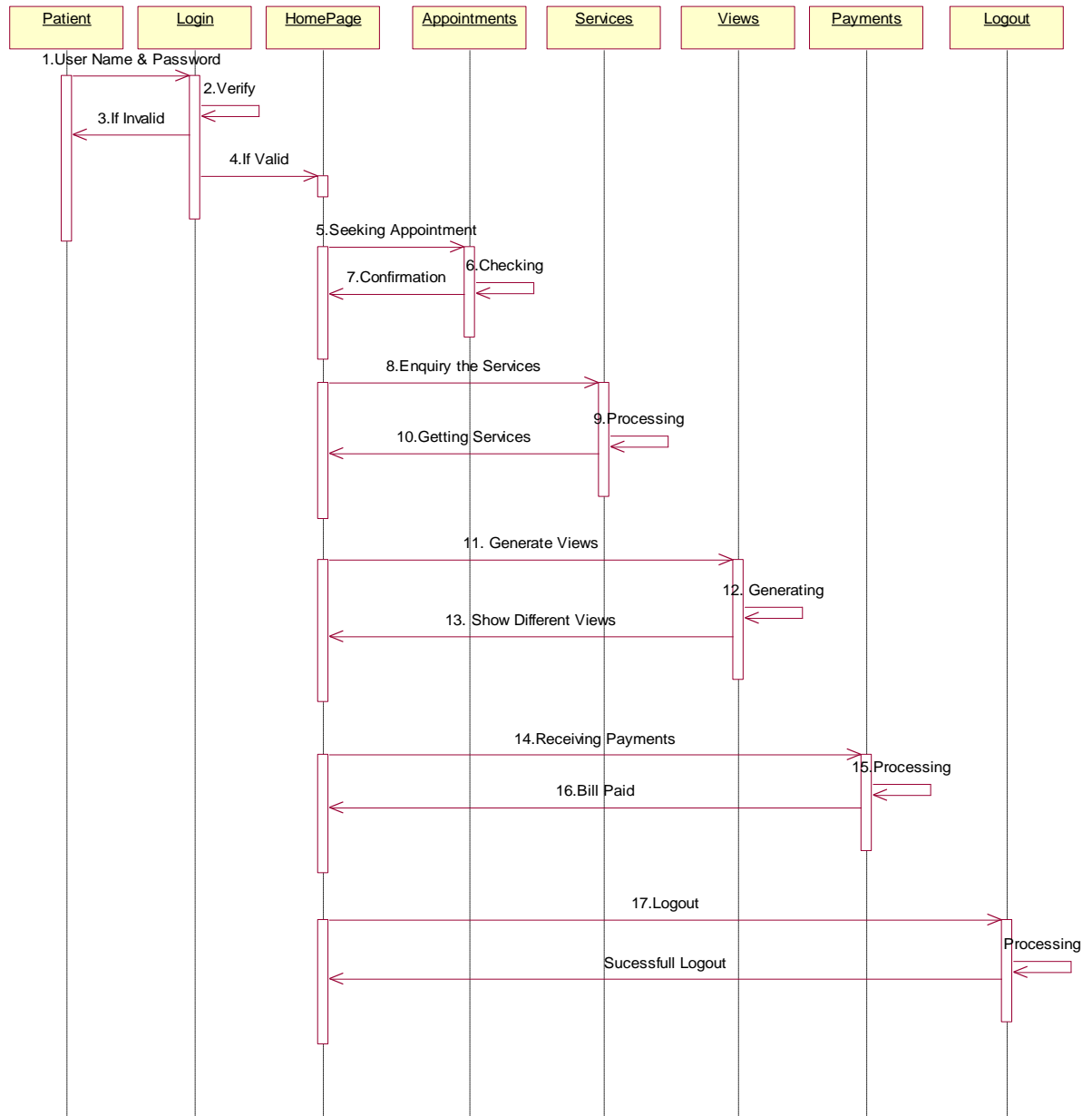


Figure: 9 Sequence Diagram for patient

Sequence Diagram for public

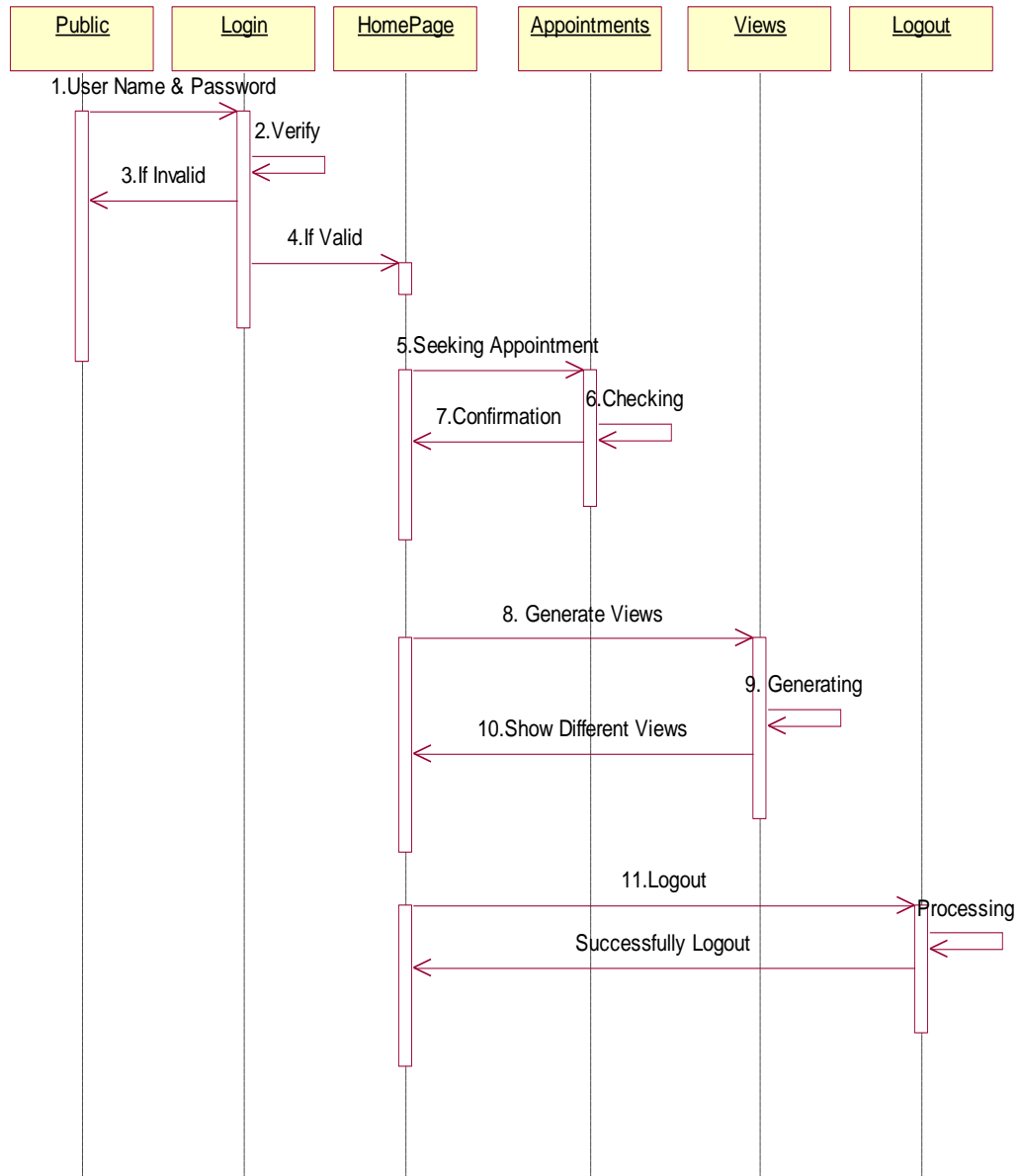


Figure: 10 Sequence Diagram for public

Collaboration Diagram for Admin

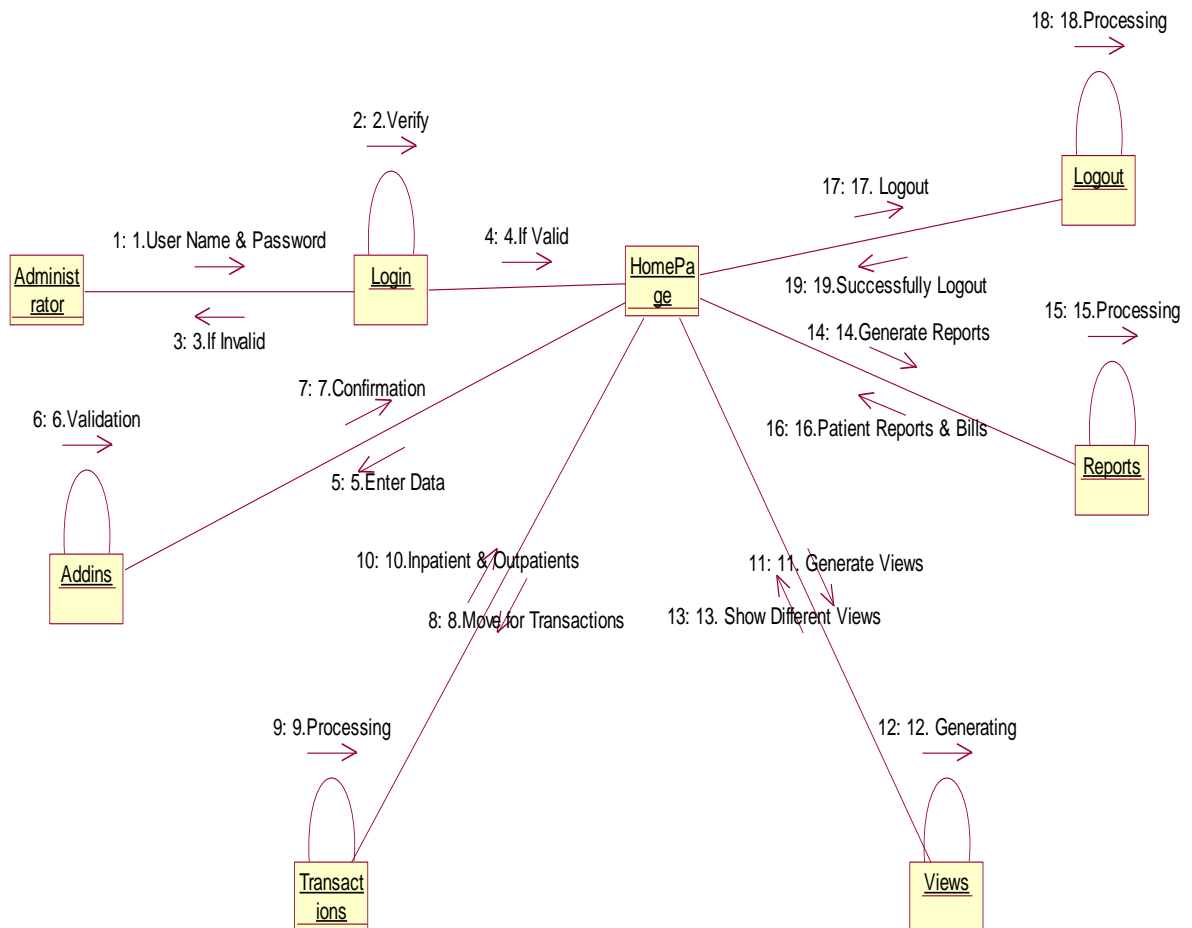


Figure: 11 Collaboration Diagram for Admin

Collaboration Diagram for Patient

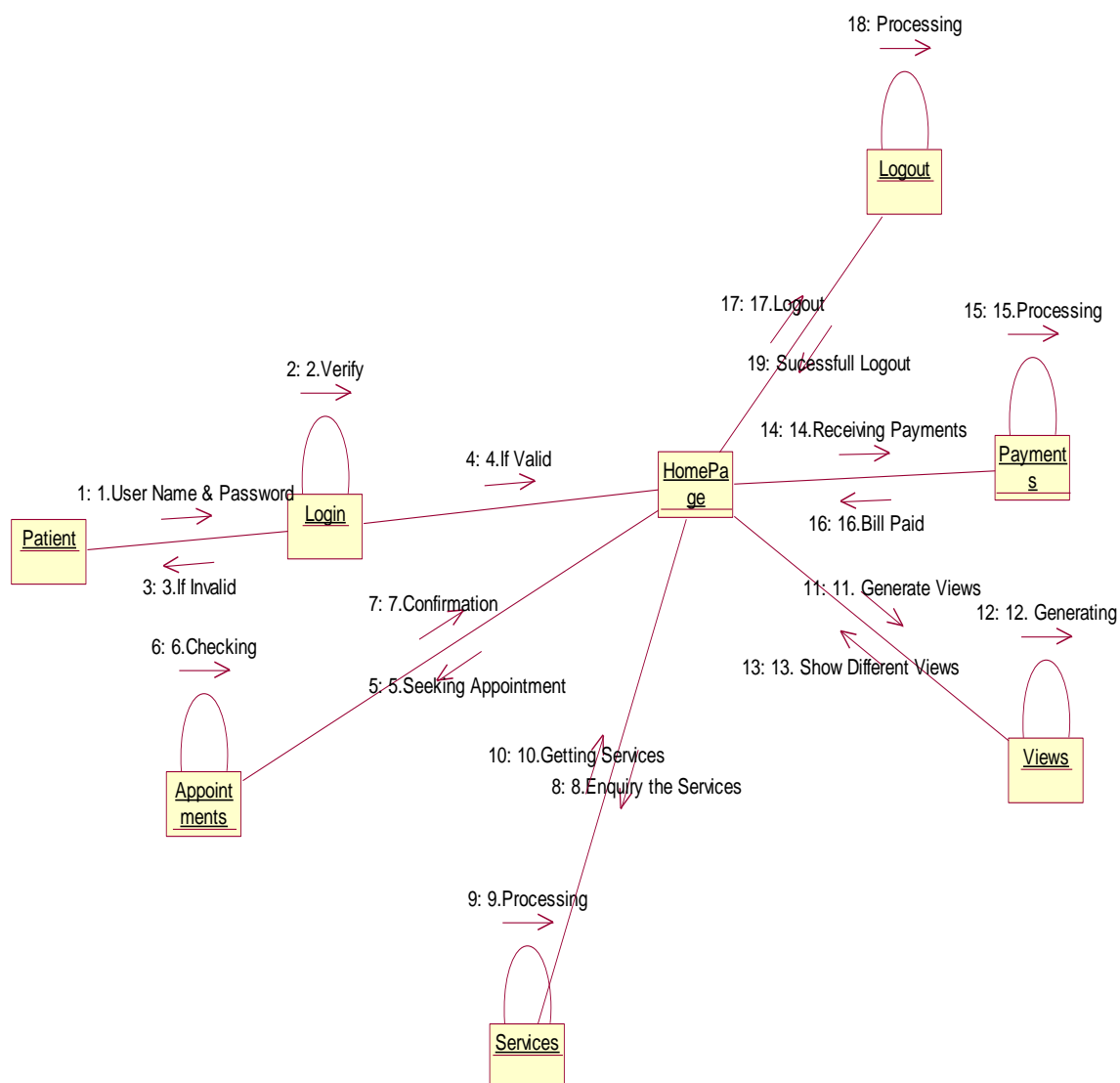


Figure: 12 Collaboration Diagram for Patient

Collaboration Diagram for public

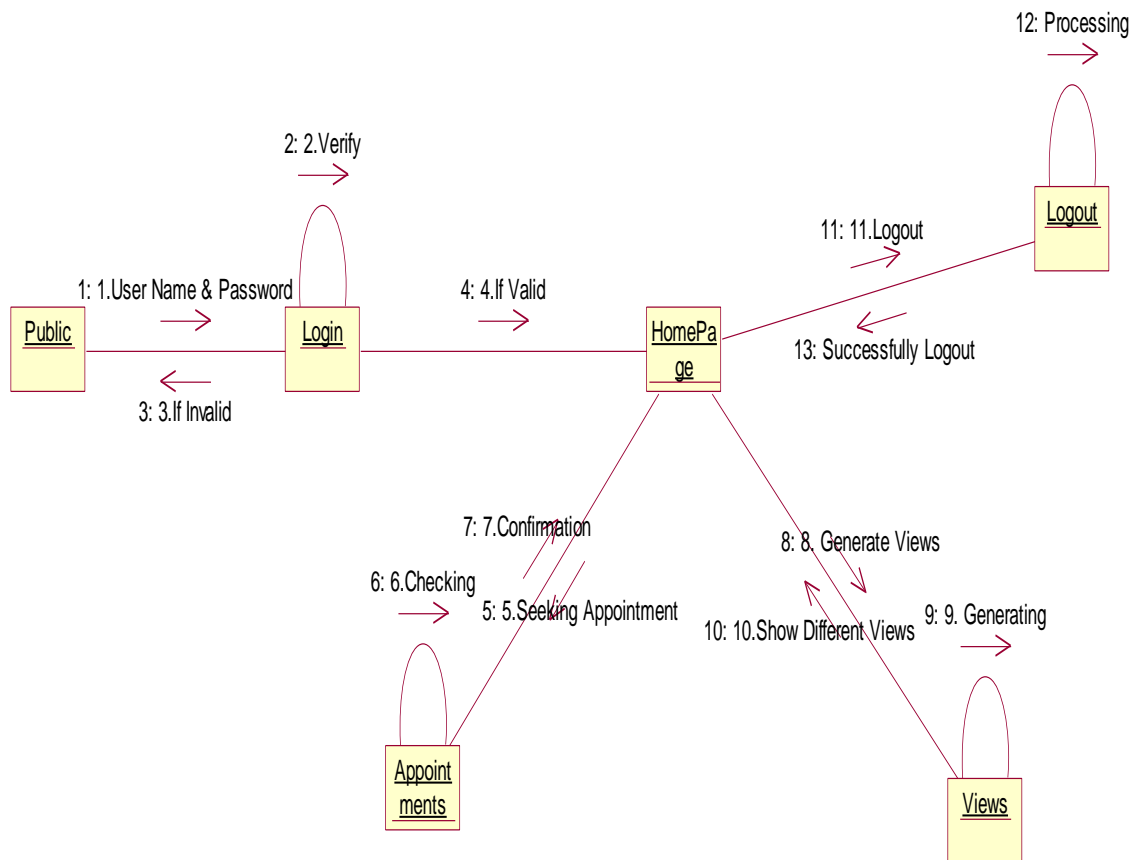


Figure: 13 Collaboration Diagram for public

State chart Diagram for Admin

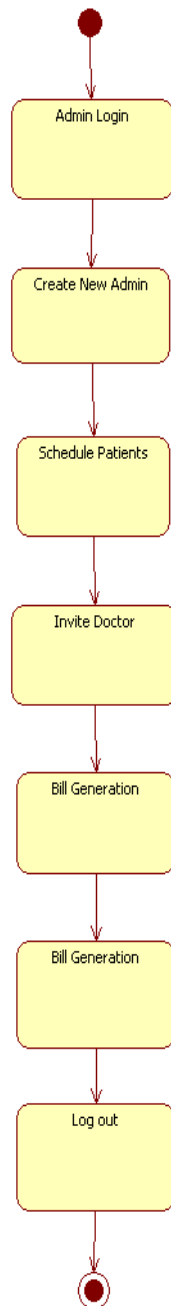


Figure 14: State chart Diagram for Admin

StateChart Diagram for Patient

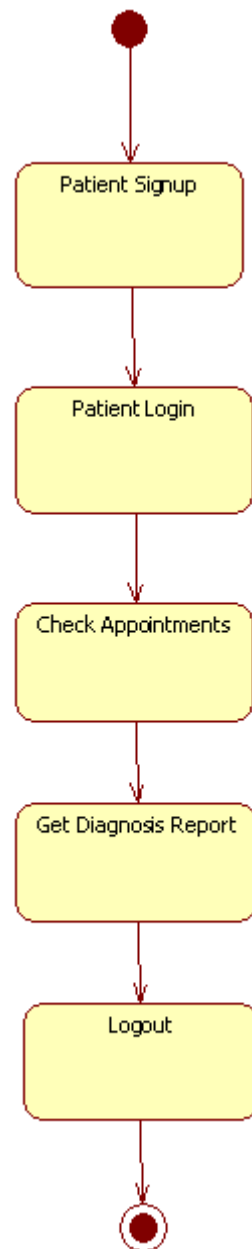


Figure 15 StateChart Diagram for Patient

State ChartDiagram for Doctor

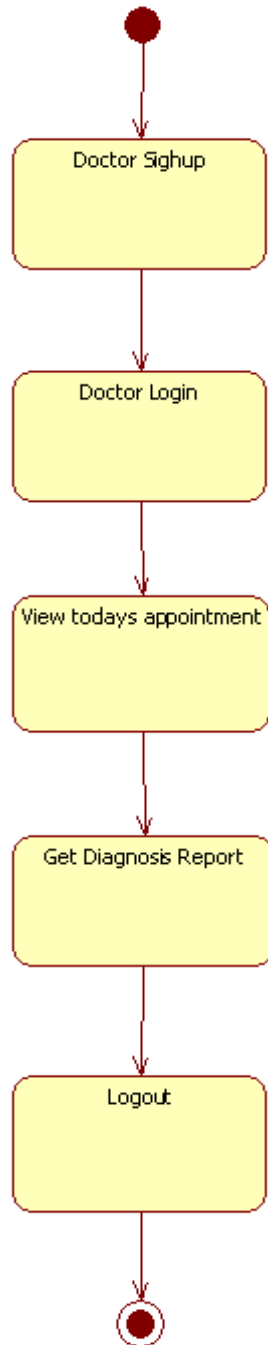


Figure 16 State ChartDiagram for Doctor

5. TECHNOLOGIES USED

5.1 JAVA

In my project, I have chosen **Java** language for developing the code.

About Java

Initially the language was called as “**Oak**” but it was renamed as “**Java**” in 1995. The primary motivation of this language was the need for a platform-independent (i.e., architecture neutral) language that could be used to create software to be embedded in various consumer electronic devices.

- Java is a programmer’s language.
- Except for those constraints imposed by the internet environment, Java gives the programmer, full control.
- Finally, java is to internet programming where C was to system programming.

Importance of Java to the Internet

Java has had a profound effect on the Internet. This is because, Java expands the Universe of objects are transmitted between the Server and the Personal Computer. They are: Passive information and Dynamic active programs. The Dynamic, Self-executing programs cause serious problems in the areas of Security and probability. But, Java addresses those concerns and by doing so, has opened the door to an exciting new form of program called Applet.

Java can be used create two types of programs

Applications and Applets: An application is a program that runs on our Computer under the operating system of that computer. It is more or less like one creating using C or C++. Java’s ability to create Applets makes it important. An Applet is an application designed to be transmitted over the Internet and executed by a Java-compatible web browser.

And applet is actually a tiny Java program, dynamically downloaded across the network, just like an image. But the difference is, it is intelligent program, not just a media file. It can react to the user input and dynamically change.

Features of java

- **Security**

Every time you that you download a “normal” program; you are risking a viral infection. Prior to Java, most users did not download executable programs frequently, and those who did scan them for viruses prior to execution. Most users still worried about malicious program exists that must be guarded against. This type of program can gather private information. Such as credit card numbers, bank account balances, and passwords. Java answers the both of these concerns by providing a “firewall” between a networked application and your computer.

- **Portability**

For programs to be dynamically downloaded to all the various types of platforms connected to the Internet, some means of generating portable executable code is needed as you will see the same mechanism that helps ensure security also helps create portability. Indeed, Java’s solution to these two problems is both elegant and efficient.

- **The Byte code**

The key that allows the Java to solve the security and portability problems is that the output of Java compiler is Byte code. Byte code is a highly optimized set of instructions designed to be executed by the Java run-time system, which is called the Java Virtual Machine (JVM). That is, in its standard form, the JVM is an interpreter for byte code. Translating a java program into byte code helps makes it much easier to run a program in a wide variety of environments. The reason is, once the run-time package exists for a given system, any Java program can run on it.

Although Java was designed for interpretation, there is technically nothing about Java that prevents on-the-fly compilation of byte code into native code. Sun has just completed its Just In

Time (JIT) compiler for byte code. When the JIT compiler is a part of JVM, it compiles byte code into executable code in real time, on a piece –by-piece, all at once, because Java performs various run-time checks that can be done only at run Java Virtual Machine (JVM).

Beyond the language, there is the Java virtual machine. The java virtual machine is an important element of the java technology. The virtual machine can be embedded within a web browser or an operating system. Once a piece of Java code is loaded onto a machine, it is verified. As part of the loading process, a class loader is invoked and does byte code verification makes sure that the code that's has been generated by the compiler will not corrupt the machine that it's loaded on. Byte code verification takes place at the end of the compilation process to make sure that is all accurate and correct. So byte code verification is integral to the compiling and executing of Java code

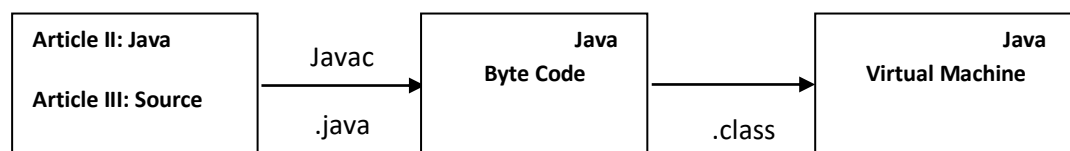


Figure: 15 Development process of java programming

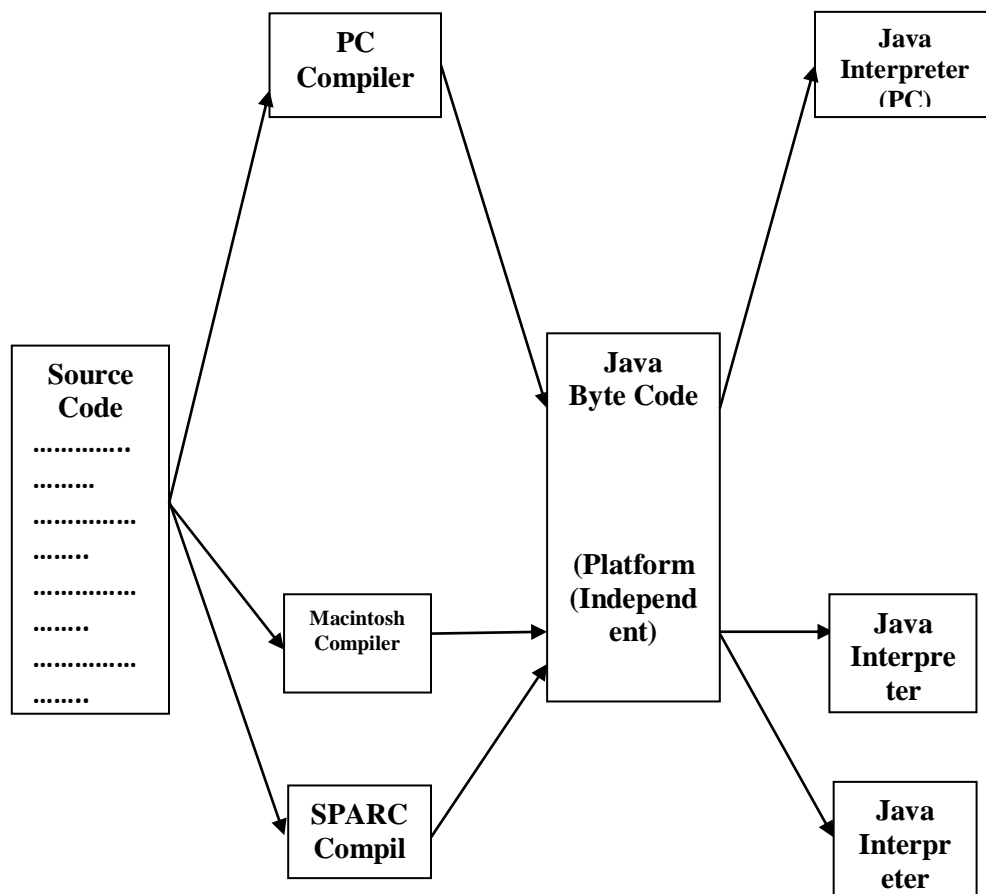
- **Java Architecture**

Java architecture provides a portable, robust, high performing environment for development. Java provides portability by compiling the byte codes for the Java Virtual Machine, which is then interpreted on each platform by the run-time environment. Java is a dynamic system, able to load code when needed from a machine in the same room or across the planet.

- **Compilation of code:**

When you compile the code, the Java compiler creates machine code (called byte code) for a hypothetical machine called Java Virtual Machine (JVM). The JVM is supposed to execute the byte code. The JVM is created for overcoming the issue of portability. The code is written and compiled for on machine and interpreted on all machines. This machine is called Java Virtual Machine.

- **Compiling and interpreting Java Source Code**



During run-time the Java interpreter tricks the byte code file into thinking that it is running on a Java Virtual Machine. In reality this could be a Intel Pentium Windows 95 or sun SARC station running Solaris or Apple Macintosh running system and all could receive code from any computer through Internet and run the Applets.

- **Simple**

Java was designed to be easy for the Professional programmer to learn and to use effectively. If you are an experienced C++ programmer, learning Java will be even easier. Because Java inherits the C/C++ syntax and many of the object oriented features of C++. Most of the confusing concepts from C++ are either left out of Java or implemented in a cleaner, more approachable manner. In java there are a small number of clearly defined ways to accomplish a given task.

- **Object-Oriented**

Java was not designed to be source code compatible with any other language. This allowed the Java team the freedom to design with a blank slate. One outcome of this was a clean usable, pragmatic approach to objects. The object model in java is simple and easy to extend, while simple types, such as integers, are kept as high-performance non-objects.

- **Robust**

The multi-platform environment of the Web places extraordinary demands on a program, because the program must execute reliably in a variety of systems. The ability to create robust programs was given a high priority in the design of Java. Java is strictly typed language; it checks your code at compile time and runtime.

Java virtually eliminates the problems of memory management and deallocation, which is completely automatic. In a well-written Java program, all run time errors –can and should –be managed by your program.

5.2 SERVLETS

Introduction

The Java Web server is javasofts own web Server. The java web server is just a part of a larger framework, intended to provide you not just with a web server, but also with tools. To build customized network servers of any Internet or Intranet client/server system. Servlets are to a web server, how applets are to browser.

About servlets

Servlets provide a Java –based solution used to address the problems currently associated with doing server-side programming, including inextensible scripting solutions, platform-specific APIs, and incomplete interfaces.

Servlets are objects that conform to a specific interface that can be plugged into a Java-based server. Servlets are to the server-side what applets are to the client-side-object byte codes that can be dynamically loaded off the net. They differ from applet that they are faceless objects (without graphics or a GUI component). They serve as platform independent, dynamically loadable, pluggable helper byte code objects on the server side that can be used to dynamically extend server-side functionality.

For example, an HTTP Servlets can be used to generate dynamic HTML content. When you use servlets to do dynamic content you get the following advantages:

- They're faster and cleaner than CGI scripts.
- They use a standard API (the Servlets API).
- They provide all the advantages of Java (run on a variety of servers without needing to be rewritten).

5.3 JAVA SCRIPT

JavaScript is a script-based programming language which was developed by Netscape Communication Corporation. JavaScript was originally called Live Script and renamed as JavaScript to indicate its relationship with Java.

JavaScript supports the development of both client and server components of Web-based applications. On the client side, it can be used to write programs that are executed by a Web browser within the context of a Web page. On the server side, it can be used to write web server programs that can process information submitted by a Web browser and then updates the browser's accordingly.

Even though **JavaScript** supports both client and server Web programming, we prefer JavaScript at Client side programming since most of the browsers supports it.

JavaScript is almost as easy to learn as HTML, and JavaScript statements can be included in HTML documents by enclosing the statements between a pair of scripting tags `<SCRIPT>...</SCRIPT>`.

```
<SCRIPT LANGUAGE="JavaScript">
```

JavaScript statements

```
</SCRIPT>
```

Here are a few things we can do with JavaScript:

- Validate the contents of a form and make calculations.
- Add scrolling or changing messages to the Browser's status line.
- Animate images or rotate images that change when we move the mouse over them.
- Detect the browser in use and display different content for different browsers.
- Detect installed plug-ins and notify the user if a plug-in is required.

We can do much more with JavaScript, including creating entire application.

JavaScript vs. Java

JavaScript and Java are entirely different languages. A few of the most glaring differences are:

- Java applets are generally displayed in a box within the web document; JavaScript can affect any part of the Web document itself.
- While JavaScript is best suited to simple applications and adding interactive features to Web pages. Java can be used for incredibly complex applications. There are many other differences but the important thing to remember is that JavaScript and Java are separate languages. They are both useful for different things; in fact they can be used together to combine their advantages.

Advantages

- JavaScript can be used for Server-side and Client-side scripting. It is more flexible than VBScript.
- JavaScript is the default scripting languages at Client-side since all the browsers supports it.

5.4 JAVA SERVER PAGES (JSP)

A JSP page is a text-based document that describes how to process a request to create a response. The description intermixes template data with some dynamic actions and leverages on the Java Platform.

The Java Server Pages specification includes:

- Standard directives
- Standard actions

- Script language declarations, script lets and expressions
- A portable tag extension mechanism.

Directives and Actions

There may be two types of elements in a JSP page: **directives** or **actions**. Directives provide global information that is conceptually valid independent of any specific request received by the JSP page. For example, a directive can be used to indicate the scripting language to use in a JSP page. Actions may, and often will, depend on the details of the specific request received by the JSP page. If a JSP container uses a compiler or translator, the directives can be seen as providing information for the compilation/translation phase, while actions are information for the subsequent request processing phase.

An action may create some objects and may make them available to the scripting elements through some scripting-specific variables.

Directive elements: Syntax:

```
<% @ directive ... %>
```

Action elements: tag:<mytag attr1="attribute value" ...>

body

```
</mytag>
```

or an empty tag

```
<mytag attr1="attribute value" .../>
```

An element type abstracts some functionality by defining a specialized (sub)language that allows more natural expression of the tasks desired, can be read and written more easily by tools and also can even contribute specialized yet portable tool support to create them. The JSP specification provides a Tag Extension mechanism that enables the addition of new actions, thus

allowing the JSP page “language” to be easily extended in a portable fashion. A typical example would be elements to support embedded database queries. Tag libraries can be used by JSP page authoring tools and can be distributed along with JSP pages to any JSP container like Web and Application servers.

The Tag Extension mechanism can be used from JSP pages written using any valid scripting language, although the mechanism itself only assumes a Java run time environment. Custom actions provide access to the attribute values and to their body; they can be nested and their bodies can include scripting elements.

Execution

A JSP page is executed in a JSP container, which is installed on a Web server, or on a Web enabled application server. The JSP container delivers requests from a client to a JSP page and responses from the JSP page to the client. All JSP containers must support HTTP as a protocol for requests and responses, but a container may also support additional request/response protocols. The default request and response objects are of type `HttpServletRequest` and `HttpServletResponse`, respectively.

Compilation

JSP pages may be compiled into its JSP page implementation class plus some deployment information. This enables the use of JSP page authoring tools and JSP tag libraries to author a Servlet. This have several benefits:

Removal of the start-up lag that occurs when a JSP page delivered as source receives the first request & Reduction of the footprint needed to run a JSP container, as the java compiler is not needed.

Objects and Scopes

JSP page can create and/or access some Java objects when processing a request. The JSP specification indicates that some objects are created implicitly, perhaps as a result of a directive other objects are created explicitly through actions; objects can also be created directly using

scripting code, although this is less common. The created objects have a scope attribute defining where there is a reference to the object and when that reference is removed.

5.5 HTML

Hypertext Markup Language (HTML), the languages of the World Wide Web (WWW), allows users to produce Web pages that include text, graphics and pointer to other Web pages (Hyperlinks).

HTML is not a programming language but it is an application of ISO Standard 8879, **SGML (Standard Generalized Markup Language)**, but specialized to hypertext and adapted to the Web. The idea behind Hypertext is that instead of reading text in rigid linear structure, we can easily jump from one point to another point. We can navigate through the information based on our interest and preferences.

A markup language is simply a series of elements, each delimited with special characters that define how text or other items enclosed within the elements should be displayed. Hyperlinks are underlined or emphasized words that load to other documents or some portions of the same documents.

HTML can be used to display any type of document on the host computer, which can be geographically at a different location. It is a versatile language and can be used on any platform or desktop.

HTML provides tags (special codes) to make the document look attractive. HTML tags are not case-sensitive. Using graphics, fonts, different sizes, color, etc., can enhance the presentation of the document. Anything that is not tag is part of the document itself.

Basic HTML Tags

<code><! --- --></code>	specifies comments
<code><A>.....</code>	Creates hypertext links
<code>..... </code>	Formats text as bold

<BIG>.....</BIG>	Formats text in large font
<BODY>..... </BODY>	Contains all tags and text in the HTML document
<CENTER>.... </CENTER>	Creates text
<DD>.....</DD>	Definitions of a term
<DL>.....</DL>	Creates definition list
..... 	Formats text with a particular font
<FORM>.....</FORM>	Encloses a fill-out form
<FRAME>.... </FRAME>	Defines a particular frame in a set of frames
<H#>.....</H#>	Creates headings of different levels
<HEAD>.....</HEAD>	Contains tags that specify information about a document
<HR>.....</HR>	Creates a horizontal rule
<HTML>.....</HTML>	Contains all other HTML tags
<META>.....</META>	Provides meta-information about a document
<SCRIPT>.....</SCRIPT>	Contains client-side or server-side script
<TABLE>.....</TABLE>	Creates a table
<TD>.....</TD>	Indicates table data in a table
<TR>.....</TR>	Designates a table row
<TH>.....</TH>	Creates a heading in a table.

Advantages

- A HTML document is small and hence easy to send over the net. It is small because it does not include formatted information.
- HTML is platform independent and HTML tags are not case-sensitive.

5.6 Java Database Connectivity

What is JDBC

JDBC is a Java API for executing SQL statements. (As a point of interest, JDBC is a trademarked name and is not an acronym; nevertheless, JDBC is often thought of as standing for Java Database Connectivity. It consists of a set of classes and interfaces written in the Java programming language. JDBC provides a standard API for tool/database developers and makes it possible to write database applications using a pure Java API.

Using JDBC, it is easy to send SQL statement to virtually any relational database. One can write a single program using the JDBC API, and the program will be able to send SQL statements to appropriate database. The combinations of java and JDBC lets a programmer write it once and run it anywhere.

What Does JDBC Do

Simply put, JDBC makes it possible to do three things:

- Establish a Connection with a database
- Send SQL statements
- Process the results

JDBC versus ODBC and other APIs

At this point, Microsoft's ODBC (open database Connectivity) API is that probably the most widely used programming interface for accessing relational databases. It offers the ability to connect to almost all databases on almost on almost all platforms.

So why not just use ODBC from java? The answer is that you can use ODBC from java, but this is best done with the help of JDBC in the form of the JDBC-ODBC.

Bridge, which we will cover shortly. The question now becomes “why do you need JDBC?” There are several answers to this question:

- ODBC is not appropriate for direct use from java because it uses a C Interface. Calls from java to native C code have a number of drawbacks in the security, implementation, robustness, and automatic portability of applications.
- A literal translation of the ODBC C API would not be desirable. For example, java has no pointers, and ODBC makes copious use of them including the notoriously error-prone generic pointer “void *”. You can think of JDBC as ODBC translated into an object-oriented interface that is natural for java programmers.
- ODBC is hard to learn. It mixes simple and advanced features together, and it has complex options even for simple queries. JDBC, on the other hand, was designed to keep simple things simple while allowing more advanced capabilities where required.
- A java API like JDBC is needed in order to enable a “pure java” solution. When ODBC is used, the ODBC drivers manage and drivers must be manually installed on every client machine. When the JDBC driver is written completely in java, however, JDBC code is automatically installable, portable and secure on all java platforms from network computers to mainframes.

5.7 ORACLE

Oracle is a relational database. The language used to access relational database is Structured Query language, SQL is flexible, efficient language, with features designed to manipulate and examine relational data.

SQL is fourth generation language. This means that the language describes what should be done, but not how to do it. Fourth generation languages are fairly simple and have fewer commands, 4 GL's also insulate the user from underlying data structures and algorithms.

Why to choose oracle

Oracle is popular relational database. Software is available on a wide number of platforms. Oracle provides complete control organizing the data storage to obtain good performance using indexing, clustering.

Introduction to SQL

STRUCTURED QUERY LANGUAGE is a tool of communication b/w a user and RDBMS. SQL is a simple and powerful language in the sense that most of the operations in RDBMS can be done using SQL. It is a 4'GL. The important feature is that it is not procedural, advanced of using non-procedural languages are:

- Reduction of code
- Simplicity in writing code.
- Ease of maintenance.

SQL is made of 3 sub languages:

DDL: Data Definition Language consists of commands to create the objects, such as tables, views, indexes etc.

DML: Data Manipulation Language is used to querying, inserting deleting and updating of information stored in the database.

DCL: Data Control Language is used to control data and access to the database in the multi-user environment for security purpose. The DCL is used for giving access to different users.

ORACLE Utilities

Oracle utilities enhance RDBMS support of data entry, maintenance and retrieval. They are Export, import and SQL Loader.

EXPORT

Export is the only utility provided for oracle. Export writes data from an oracle database into oracle binary format files. The export makes a copy of data structure in an operating system file.

To export

- A user must have DBA privileges to Oracle database.
- A user must own tables to be exported.
- Before running there must be enough storage space on disk of tape to write exported files. If there is not enough space, export will terminate with a write failure error.
- The information that is to be exported depends upon the mode chosen.

- Export modes are tables, user, and full database.
- Export can be of three types incremental, cumulative and complete.

IMPORT

Import reads files created by export and places data in the database. To import user should have connection or privileges to an oracle database and access to an export file.

Only a DBA can import a file exported by him/her. A table is imported in to its original table space using the original storage parameters. If the storage space does not exist then the system uses default space of the current user. If an error occurs the import prints an error message and skips to the next table and continues the processing.

SQL * Loader

It is a tool for loading data from external files into oracle database. There are two mechanisms used to load data. Two types of inputs are to be provided to SQL * Loader.

6. DATA DICTIONARY

6.1 Data base design

Introduction

A database model is a collection of logical constructs used to represent the data in data structures and data relationships within the database. Basically, the database models may be grouped into two categories: conceptual model and implementation models. The conceptual model focuses on the logical nature of that data presentation. Therefore the conceptual model is concerned with what is representing in the database and the implementation model is concerned with how it is represented.

- **Conceptual Model**

The conceptual model represents data present in the entities as well the relations present in the entities. All the strong entities and weak entities are identified here and it mainly focuses on the logical nature of that data presentation.

- **General Access Model**

General access model is used to convert the ER model into the relation model. Here we can identify the references to the other entities and the nature of the each attribute. But, A network model's record can have more than one parent.

- **Relation Model**

The relational model is represented as tables. The columns of each table are attributes that define the data or value domain for entities in that column. The rows of each table are tuples representing individual data objects being stored. A relational table should have only one primary key. A Primary key is a combination of one or more attributes whose value unambiguously locates each row in the table. Database normalization is a design technique by which relational database tables are structured in such a way as to make them invulnerable to certain types of logical inconsistencies and anomalies.

Tables can be normalized to varying degrees: relational database theory defines “normal forms” of successively higher degrees of stringency, so, for example, a table in third normal form is less open to logical inconsistencies and anomalies than a table that is only in second normal form. Although the normal forms are after defined (informally) in terms of the characteristics of tables, rigorous definitions of the normal forms are concerned with the characteristics of mathematical constructs known as relations. Whenever information is represented relationally—that is, roughly speaking, as values within rows beneath fixed column headings—it makes sense to ask to what extent the representation is normalized.

6.2 Normal forms

The normal forms (abbrev. NF) of relational database theory provide criteria for determining a table's degree of vulnerability to logical inconsistencies and anomalies. The higher the normal form applicable to a table, the vulnerable it is to such inconsistencies and anomalies. Each table has a "highest normal form" (HNF): by definition, a table always meets the requirements of its HNF; also by definition, a table fails to meet the requirements of any normal form higher than its HNF.

First Normal Form

The criteria for first normal form (1NF) are:

- A table must be guaranteed not to have any duplicate records; therefore it must have at least one candidate key.
- There must be no repeating groups, i.e. no attributes which occur a different number of times on different records. For example, suppose that an employee can have multiple skills: a possible representation of employees' skills is {Employee ID, Skill1, Skill2, Skill3.....}, where {Employee ID} is the unique identifier for a record. This representation would not be in 1NF.
- Note that all relations are in 1NF. The question of whether a given representation is in 1NF is equivalent to the question of whether it is a relation.

Second Normal Form

The criteria for second normal form (2NF) are:

- The table must be in 1NF.
- None of the non-prime attributes of the table are functionally dependent on a part (proper subset) of a candidate key; in other words, all functional dependencies of non-prime attributes on candidate keys are full functional dependencies. For example, consider a "Department Members" table whose attributes are Department ID, Employee ID, and Employee Date of Birth; and suppose that an employee works in one or more departments. The combination of Department ID and Employee ID and Employee ID

uniquely identifies records within the table. Given that Employee Date of Birth depends on only one of those attributes – namely, Employee ID – the table is not in 2NF.

Third Normal Form

The criteria for third normal form (3NF) are:

- The table must be in 2NF.
- There are no non-trivial functional dependencies between non-prime attribute is only indirectly dependent (transitively dependent) on a candidate key, by virtue of being functionally dependent on another nonprime attribute. For example, consider a “Departments” table whose attributes are Department ID, Department Name, Manager ID, and Manager Hire Date; and suppose that each manager can manage one or more departments. {Department ID} is a candidate key. Although Manager Hire Date is functionally dependent on {Department ID}, it is also functionally dependent on the non-prime attribute Manager ID. This means the table is not in 3NF.

Boyce-Codd Normal Form

The criteria for Boyce-Codd Normal Form (BCNF) are:

- The table must be in 3NF.
- Every non-trivial functional dependency must be a dependency on a super key.

6.3Functional Dependency

Dependencies in my project are elaborated below

- First we have to take the initial table which has following fields
- Dist_name, Div_name, Mandal_name, Village_name, FPS_add, Deler_name,Licence_no, Date_Of_Issue, Ren_date, CSG_id, Rationcard_no, cardholder_name,card_type.

- In the above table we have redundant data because If we take the FPS's in one district say East-Godavari then we should again and again type that district name, resulting redundancy.
- Same situation occurs in the case of Div_name, Mandal_name, Village_name then we have to enter FPS details for each and every card holder.

Apply first normal form then we get

Dist_id	Dist_name

Div_id	Div_name
Mand_id	Mand_name

Vill_id	Vill_name

FPS_add	Deler_name	Lic_no	DOI	Ren_Date	CSG_id

Rationcard_no	Card_name	Card_type

If we are not apply the first normal form then we have anomalies (update, insert, delete)

- **Update anomaly:** if we make any update by using filed like dist_name, Div_name etc.. then all the fields which have the same dist_name, Div_name etc.. can also updated.
- **Delete anomaly:** if we delete any row by using repetition data field then we can loss the necessary data.
- **Insertion anomaly:** without FPS details we cannot insert card holder details.
- Applying second normal :
- Div_name is dependend on dist_id and div_id because according to second normal form, a relation scheme R is in 2Nf if every non attribute A in R is fully functionally depended in the primary key of R i.e., divi_name is partially depended on div_id and fully depeneded on dist_id and div_id.

Dist_id	Div_id	Div_name

Dist_id	Div_id	Mand_id	Mand_name

Dist_id	Div_id	Mand_id	Vill_id	Vill_name

- Applying third normal form:
- A functional dependency $X \rightarrow Y$ in a relation scheme R is a transitive dependency if there is set of attributes Z i.e., neither a candidate Key nor a subset of any key of R and both $X \rightarrow Z$ and $Z \rightarrow Y$ hold.

Here cardholder is dependent on FPS and FPS dependent on Dist_id, Div_id etc... i.e., rationcard_no is dependent on FPS Licence_no and FPS licence_no is dependent on dist_id, Div_id etc... so here transitive dependency holds. So rationalcard is dependent on Dist_id, div_id etc...

6.4 Database tables

Name	Type	Constraints
Did	Number	<u>Primary Key</u>
Dname	Varchar2(25)	
Location	Varchar2(25)	

Table 5.4.1 Dept

Name	Type	Constraints
Eid	Number	<u>Primary Key</u>
Ename	Varchar2(25)	
Desg	Varchar2(20)	
Did	Number	Foreign Key
DOJ	Date	

Table 5.4.2 Emp

Name	Type	Constraints
Docid	Number	<u>Primary Key</u>
Docname	Varchar2(25)	
Did	Number	Foreign Key
Exp	Number	
Desg	Varchar2(25)	
Time	Varchar2(20)	
Post	Varchar2(1)	
DOJ	Date	

Table 5.4.3 Doctor

Name	Type	Constraints
Rid	Number	<u>Primary Key</u>
Floor	Number	
NOFB	Number	
Ward	Varchar2(1)	
Status	Varchar2(1)	
Rent	Number	
Did	Number	Foreign Key

Table 5.5.4 Room

Name	Type	Constraints
Tid	Number	<u>Primary Key</u>
Tname	Varchar2(25)	

Table 5.4.5 Test

Name	Type	Constraints
Disid	Number	<u>Primary Key</u>
Disname	Varchar2(25)	
Did	Number	Foreign Key

Table 5.4.6 Disease

Name	Type	Constraints
Bedid	Number	<u>Primary Key</u>
Rid	Number	Foreign Key
Status	Varchar2(1)	

Table 5.4.7 Beds

Name	Type	Constraints
Pid	Number	<u>Primary Key</u>
Pname	Varchar2(25)	
Address	Varchar2(75)	
Phno	Number(11)	
Rid	Number	Foreign Key
DOA	Date	
DOD	Date	
TOD	Number	
Docid	Number	Foreign Key
Bid	Number	Foreign Key
Did	Number	Foreign Key

Table 5.4.8 Inpatient

Name	Type	Constraints
Slno	Number	<u>Primary Key</u>
Pname	Varchar2(25)	
Depid	Number	Foreign Key
Docid	Number	Foreign Key
Curdate	Date	
Disid	Number	Foreign Key

Table 5.4.9 Outpatient

Name	Type	Constraints
Wid	Varchar2(1)	
Wtype	Varchar2(7)	

Table 5.4.10 Ward Type

Name	Type	Constraints
Pid	Number	
Ptype	Varchar2(1)	
Tid	Number	
Tresult	Varchar2(20)	
Tdate	Date	
Did	Number	Foreign key

Table 5.4.11 Test Result

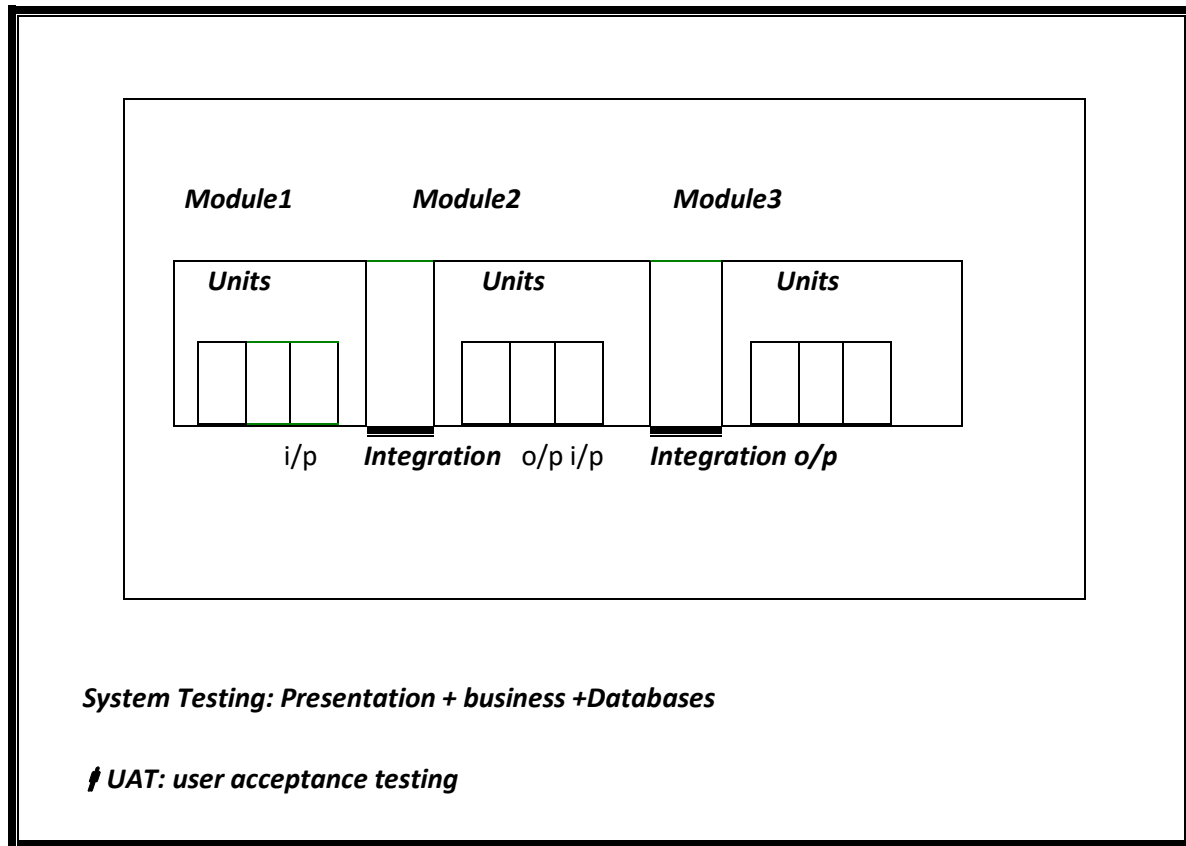
7 .TESTING

- The process of executing a system with the intent of finding an error.
- Testing is defined as the process in which defects are identified, isolated, subjected for rectification and ensured that product is defect free in order to produce the quality product and hence customer satisfaction.
- Quality is defined as justification of the requirements
- Defect is nothing but deviation from the requirements
- Defect is nothing but bug.
- Testing --- The presence of bugs.
- Testing can demonstrate the presence of bugs, but not their absence.
- Debugging and Testing are not the same thing.
- Testing is a systematic attempt to break a program or the AUT.
- Debugging is the art or method of uncovering why the script /program did not execute properly.

7.1Testing Methodologies

- **Black box Testing:** is the testing process in which tester can perform testing on an application without having any internal structural knowledge of application.
Usually Test Engineers are involved in the black box testing.
- **White box Testing:** is the testing process in which tester can perform testing on an application with having internal structural knowledge.
Usually The Developers are involved in white box testing.
- **Gray Box Testing:** is the process in which the combination of black box and white box techniques are used.

7.2 Levels of Testing



7.3 Types of Testing

- **Smoke Testing:** is the process of initial testing in which tester looks for the availability of all the functionality of the application in order to perform detailed testing on them. (Main check is for available forms)
- **Sanity Testing:** is a type of testing that is conducted on an application initially to check for the proper behavior of an application that is to check all the functionality are available before the detailed testing is conducted by on them.

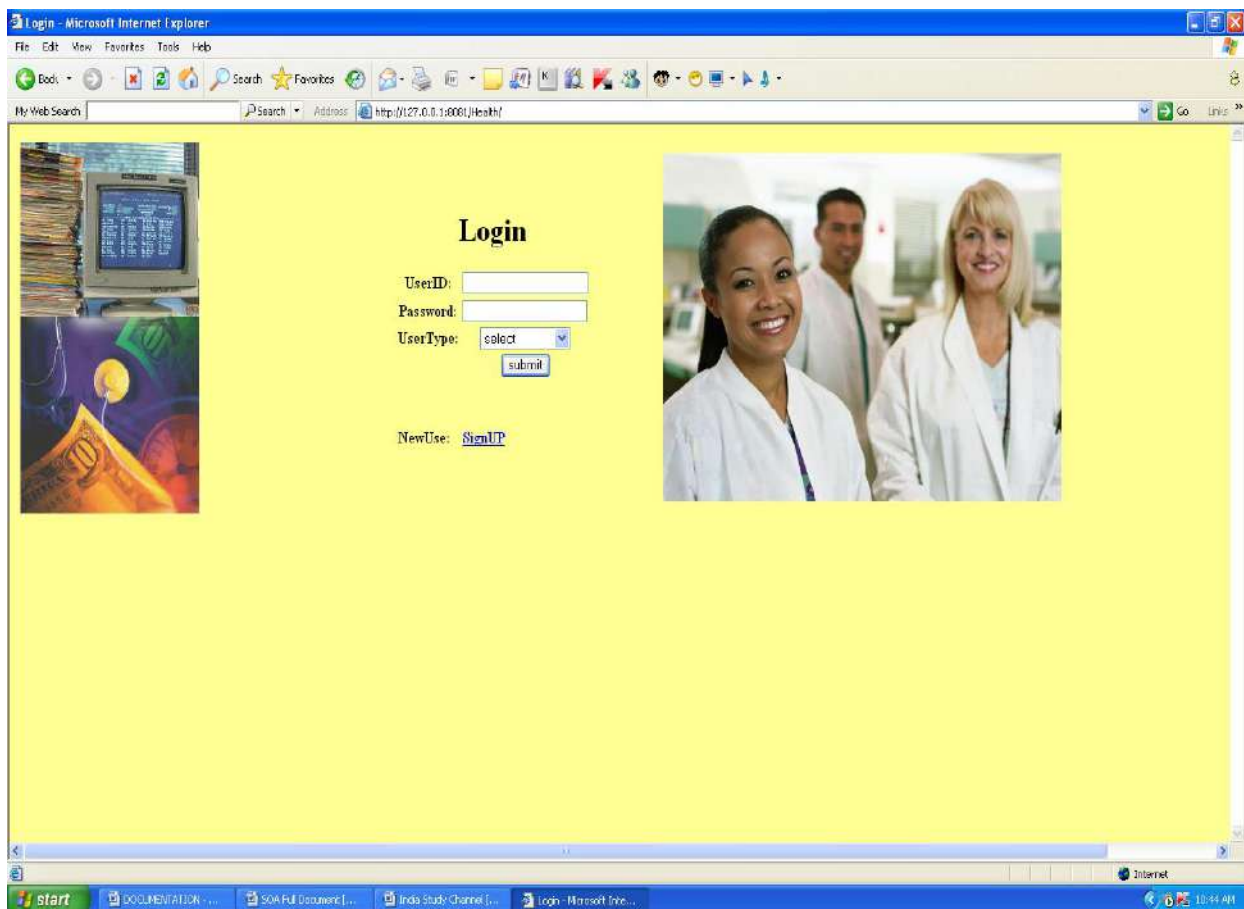
- **Regression Testing:** is one of the best and important testing. Regression testing is the process in which the functionality, which is already tested before, is once again tested whenever some new change is added in order to check whether the existing functionality remains same.
- **Re-Testing:** is the process in which testing is performed on some functionality which is already tested before to make sure that the defects are reproducible and to rule out the environments issues if at all any defects are there.
- **Static Testing:** is the testing, which is performed on an application when it is not been executed. ex: GUI, Document Testing
- **Dynamic Testing:** is the testing which is performed on an application when it is being executed. ex: Functional testing.
- **Alpha Testing:** it is a type of user acceptance testing, which is conducted on an application when it is just before released to the customer.
- **Monkey Testing:** is the process in which abnormal operations, beyond capacity operations are done on the application to check the stability of it in spite of the users abnormal behavior.
- **Compatibility testing:** it is the testing process in which usually the products are tested on the environments with different combinations of databases (application servers, browsers...etc) In order to check how far the product is compatible with all these environments platform combination.
- **Installation Testing:** it is the process of testing in which the tester try to install or try to deploy the module into the corresponding environment by following the guidelines

produced in the deployment document and check whether the installation is successful or not.

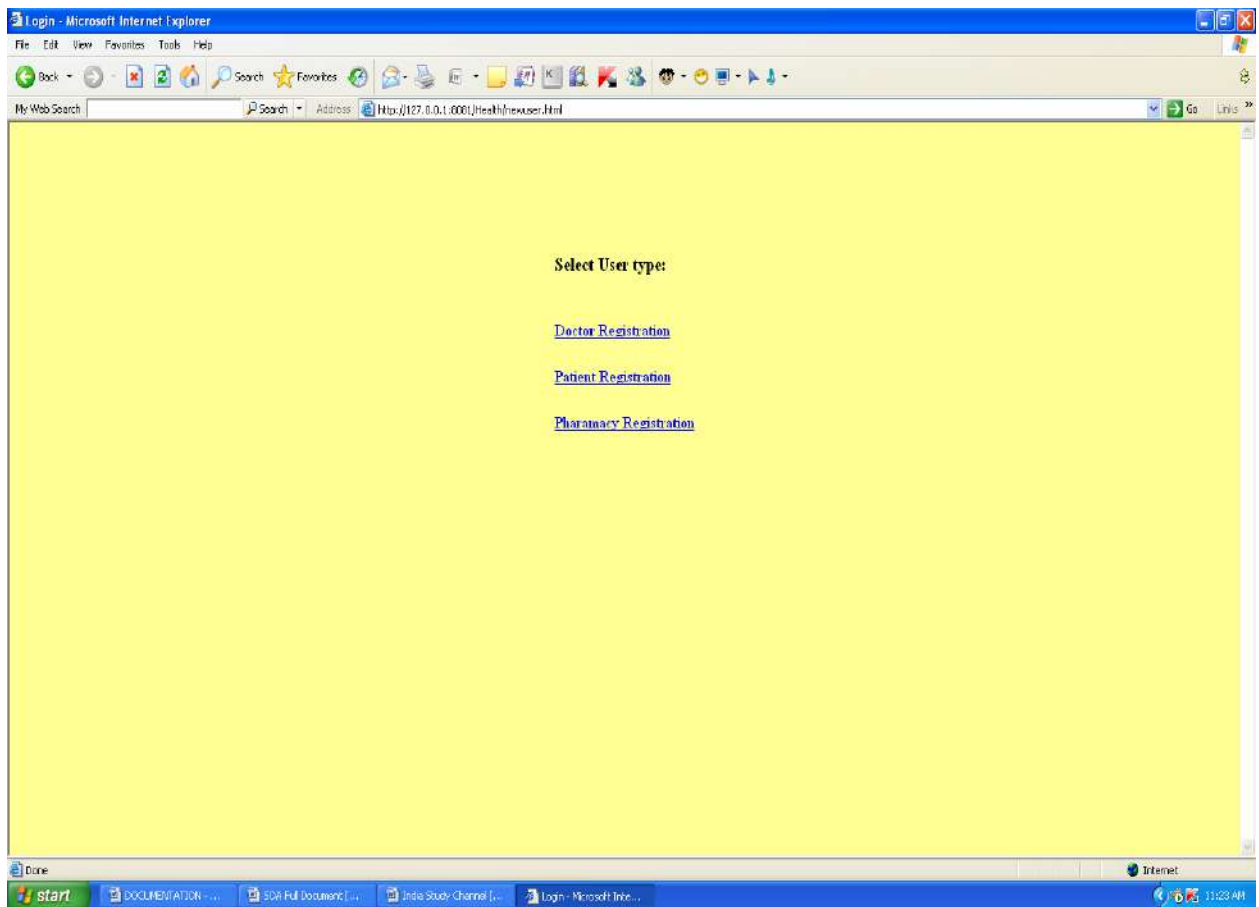
- **Adhoc Testing:** Adhoc Testing is the process of testing in which unlike the formal testing where in test case document is used, without that test case document testing can be done of an application, to cover that testing of the future which are not covered in that test case document. Also it is intended to perform GUI testing which may involve the cosmetic issues.

8.OUTPUT SCREENS

Home page



New user Registration page



Patient Registration


Patatient Registration - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Reload Home Search Favorites

My Web Search Search Address <http://127.0.0.1:8081/health/pr.jsp> Go Links

Patatient Registration



Patatient Id:

Patatient Name:

Password:

Confirm Password:

Father Name:

Age:

Address:

Problem:

Done

start DOCUMENTATION ... SCA Full document ... India Study channel ... Patatient Regstarbo...

Internet 11:56 AM

Doctor Registration page


Doctor Registration - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Search Favorites Home

My Web Search Search Address http://127.0.0.1:8081/Health/dr.jsp Go Links

Doctor Registration



Doctor Id:

Doctor Name:

Password:

Confirm Password:

Address:

Age:

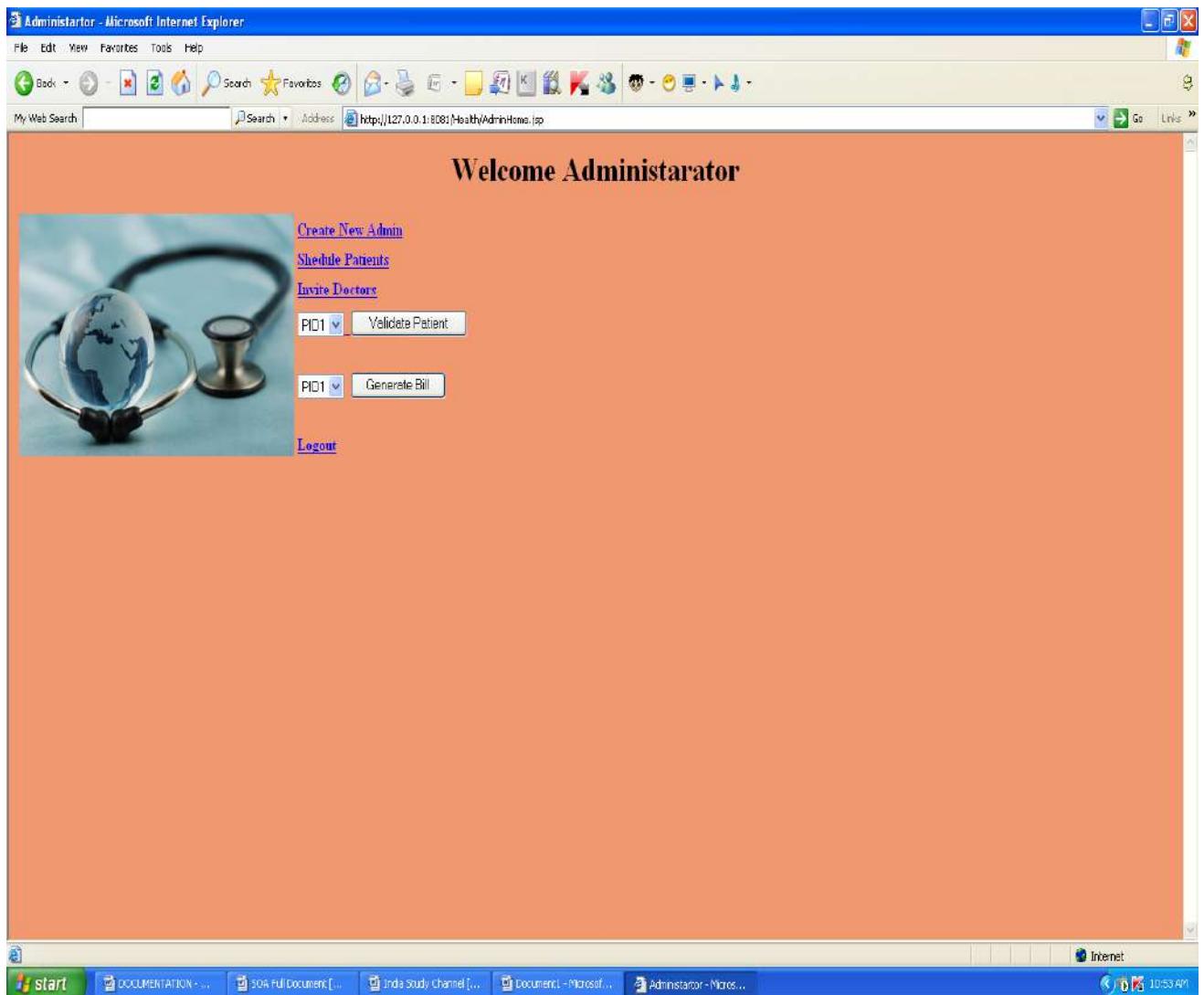
Specialization:

Qualification:

Done Internet

start DOCUMENTATION - ... SQL Full Document India Study Channel Doctor Registration - ... 11:56 AM

Admin page



Create new Admin


New Administrator - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Search Favorites Home

My Web Search Search Address <http://127.0.0.1:8081/health/mr.jsp> Go Links

Administrator Registration



Name:

Password:

Confirm Password:

DOB:

Gender:

Address:

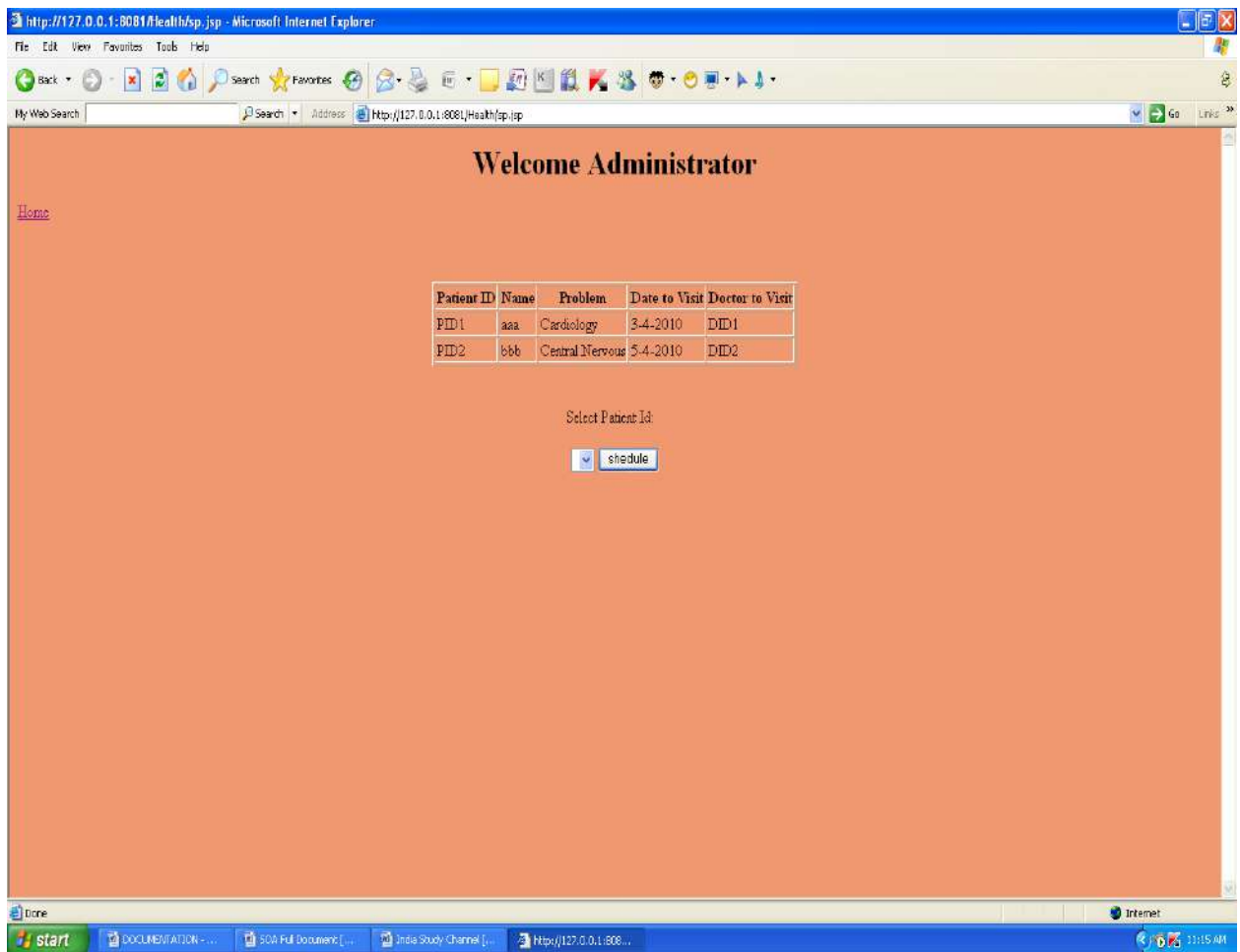
Role:

Done

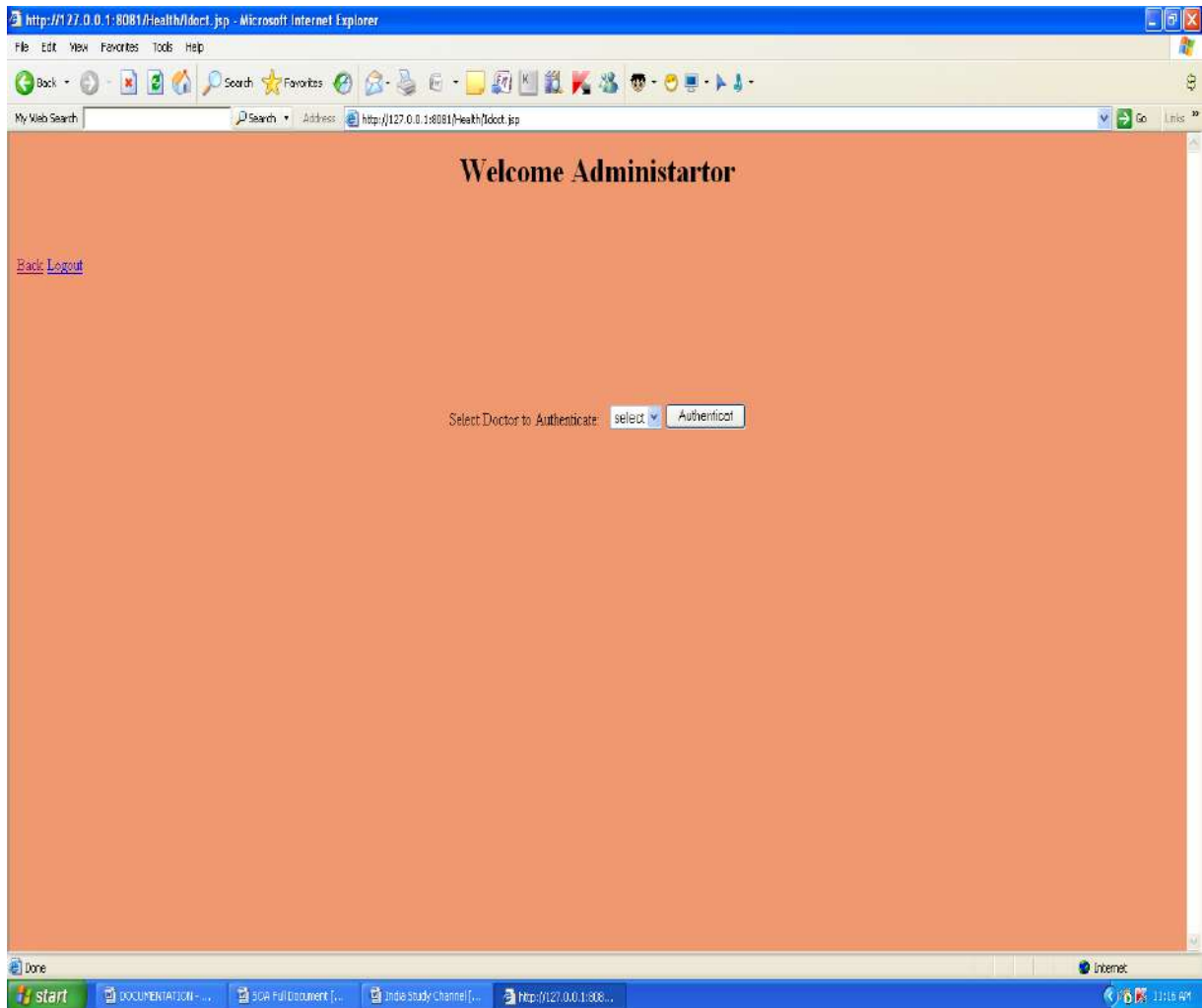
start DOCUMENTATION ... SOA Full Document... Info Study Channel... New Administrator - ...

Internet 11:12 AM

Schedule patients



Invite Doctor



Validate patient

The screenshot shows a Microsoft Internet Explorer window with the address bar displaying `http://127.0.0.1:8081/health/validatepatient.jsp`. The page has an orange background. In the top-left corner, there is a [Back](#) link. On the right side, there is a form with the following fields and values:

- Patient ID:
- Patient Name:
- age:
- Problem:
- Category:
- Consent:

Below the Consent field is a button.

The Windows taskbar at the bottom shows the Start button, several open applications (DOCUMENTATION, 204 Full Document, Info Study Channel), and the current browser window. The system clock in the bottom right corner shows 11:19 AM.

Bill Generation

Bill Generation - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Search Favorites Home

My Web Search Search Address <http://127.0.0.1:8081/Health/gbll.jsp> Go Links

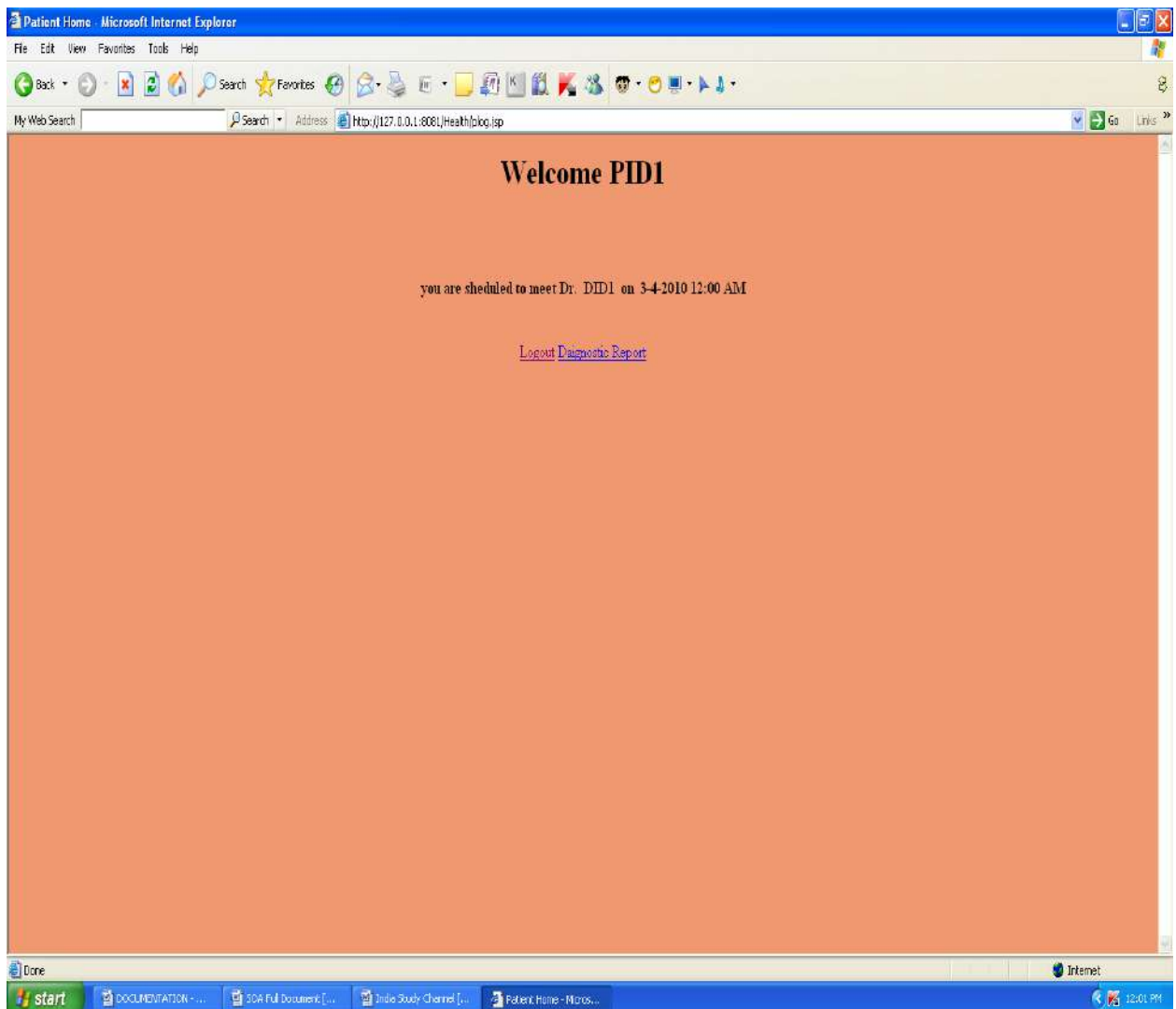
Bill Generation

Bill No:	<input type="text" value="51"/>	Category:	<input type="text" value="Halt's car"/>
Patient Id:	<input type="text" value="PID1"/>	Bill Amount:	<input type="text"/>
Bill Date:	<input type="text" value="4-4-2010"/>	Pharmacy Bill:	<input type="text"/>
Patient Name:	<input type="text" value="pico"/>	Concession(%):	<input type="text" value="34"/>

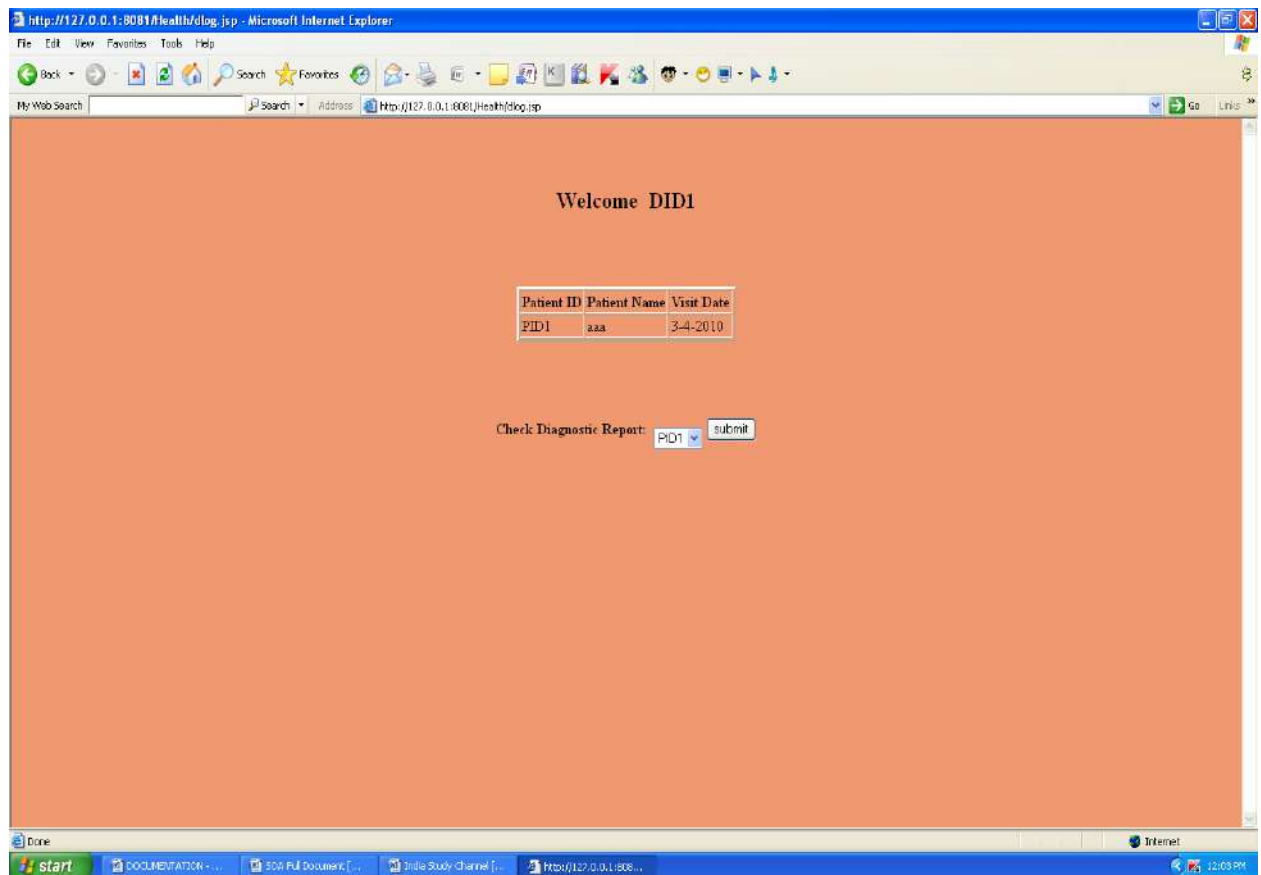
[Back](#) [logout](#)

start DOCUMENTATION - ... SDA Full document [..] India Study Channel [..] Bill Generation - Micro... Internet 11:20 AM

Patient Report page



Doctor login page containing patient's information



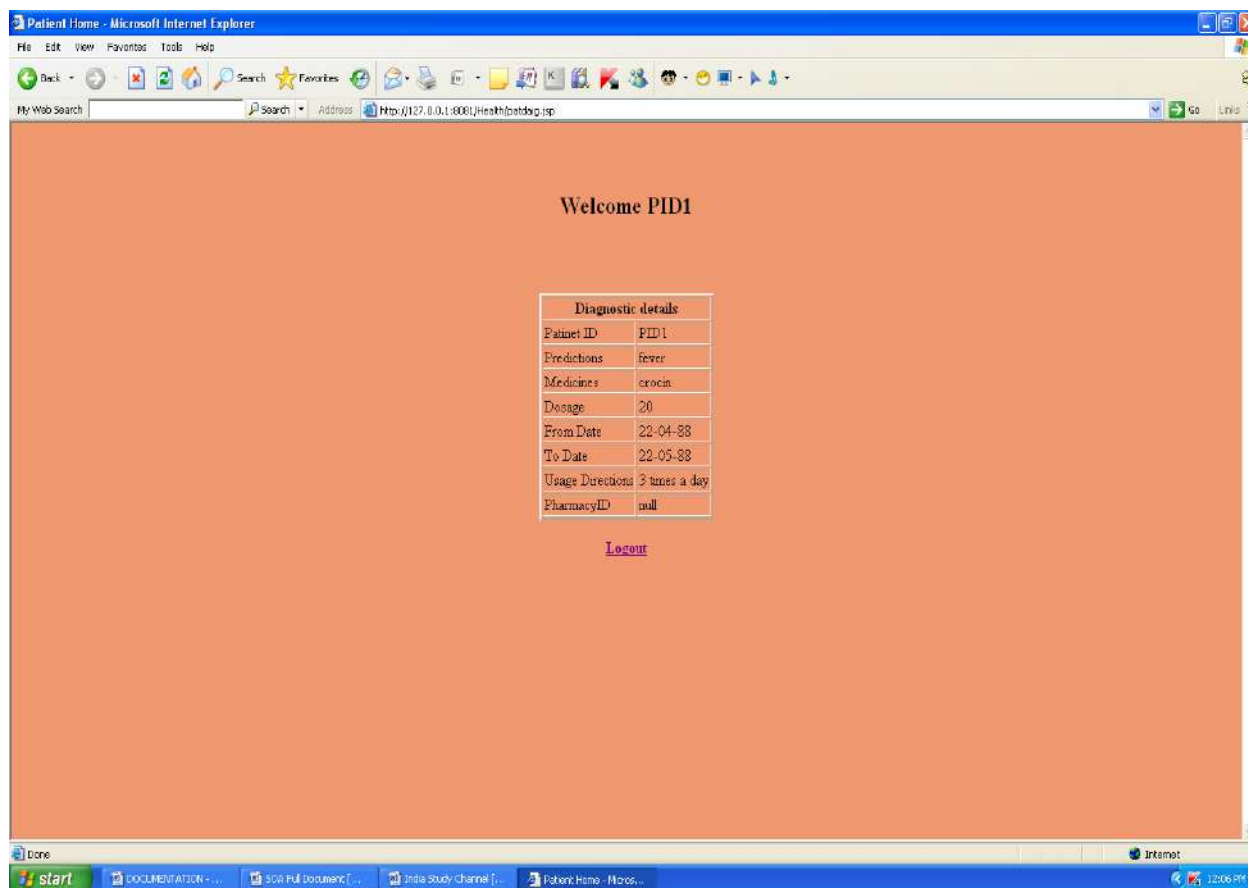
Diagnostic report of patient

The screenshot shows a Microsoft Internet Explorer window with the address bar displaying `http://127.0.0.1:8081/health/docdiag.jsp`. The page has an orange background and contains a form titled "Welcome DID1". The form fields are as follows:

- Patient ID:
- Predictions:
- Medicines:
- Dosage:
- From Date: (dd-mm-yy)
- To Date: (dd-mm-yy)
- Usage Direction:
- Pharmacy Id:
-

The Windows taskbar at the bottom shows the Start button, several open documents, and the system clock indicating 12:05 PM.

Diagnostic details of patient



9 .CONCLUSION

The growing quality demand in the hospital sector makes it necessary to exploit the whole potential of stored data efficiently, not only the clinical data, in order to improve diagnoses and treatments, but also on management, in order to minimize costs and improve the care given to the patients.

In this sense, Data Mining (DM) can contribute with important benefits to the health sector, as a fundamental tool to analyze the data gathered by hospital information systems (HIS) and obtain models and patterns which can improve patient assistance and a better use of resources and pharmaceutical expense.

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Farmers Information System

A Thesis

Submitted in partial fulfillment of the requirement

For the award of the degree in

Bachelor of Science

By

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B.Swetha Rani

B.Veeranjaneyulu

K.Lakshmi Obulamma

V.Hari Krishna

K.Sudhakar

Under the Guidance of

D.Siva Shankar M.Tech

Lecturer in Computer Science



Department of Computer Science

SKP GOVT DEGREE COLLEGE::GUNTAKAL

GUNTAKAL-515801

ANDHRA PRADESH

2021

SKP GOVT DEGREE COLLEGE::GUNTAKAL



CERTIFICATE

This is to certify that the project "Farmers Information System" is a bonafied work of G.Sreenivasulu, B.SwethaRani, B.Veeranjanyulu, K.LakshmiObulamma, V.HariKrishna, K.Sudha kar submitted to the faculty of computer department in partially fulfillment of the requirements for the award of degree of bachelor of science in Computer Science from SKP(gdc)guntakal.

Project guide

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I/c comp. science

Coordinator in Chemistry

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GUNTAKAL, Ananthapuram Dist.

External Examiner

1. Introduction

1.1 About Project:

This is a web based project which is useful for farmers and agricultural students. This is an open discussion portal providing solutions to small farmers and agricultural students. It also provides soil analysis for all regions and suggestions on which fertilizers to use where and how much? And which crop, herb or vegetable to be grown where and in which season? It also helps to make decisions on market and best prices. Information about major crop markets and their current price for the crop will be published daily. NGO's are trying to spread messages to make agriculture more eco-friendly through this site. This also includes training scheduled by agricultural officers. Training is requested by students, general public. Training provides information about crops, fertilizers, and market details that are requested. Online query handlings for all users. Queries can be posted by students, general public through mails. Queries can be directed to a particular officer. Information pages should be dynamic so that agricultural officers and administrator can change it.

2. Project Analysis

2.1 Purpose of the Project:

It is an open discussion portal used for agricultural students and farmers. Any general public can use this system for knowing the information about various crops, and the usage of fertilizers to those crops and in which soil these crops give more yield and the climatic conditions for those crops.

Training is requested by the students, general public. These trainings are scheduled by agricultural officer. Information about major crop markets and their current price for the crop will be published daily.

Current prices of the markets are updated daily by the NGO. It gives information regarding all the states in India.

2.2 Existing System:

Complexity in managing the data related to the agriculture products, soils, fertilizers, mandi/market details.

2.2.1 Problems in existing system:

- Lack of security.
- This system does not provide category wise classifications of products.
- Inefficiency in querying details.
- Periodic Report generation takes lot of time.

2.3 Proposed system:

The development of this new system contains the following activities, which try to automate the entire process keeping in the view of database integration approach.

- Reduce complexity in managing the data related to the agriculture products, soils, fertilizers, mandi/market details.
- Current system provides different access levels for security.
- Rich user interface is provided in order to interact with application.
- Reports are generated dynamically on a periodic basis.
- Efficiency in querying details.
- User Queries and Answers are maintained.

2.4 Data collection:

Early Spring:

Beets, Broccoli, Brussels Sprouts, Cabbage, Cauliflower, Carrots, Cress, Lettuce, Onions , Peas , Potatoes, Radishes , Salad Greens, Spinach

Summer:

Beans, Butter Beans (Limas), Cantaloupe/Muskmelon, Corn, Cowpeas/Crowder, Cucumbers, Eggplant ,Garlic, Herbs, Okra, Peppers, Pumpkin, Soybeans ,Squash , Sweet Potatoes, Tomatoes, Watermelon

Fall:

Beets, Broccoli, Brussels Sprouts, Cabbage, Carrots, Cauliflower, Cress, Lettuce, Peas, Radish, Salad Greens, Spinach, Turnips

Permanent Crops:

Asparagus, Blackberries, Blueberries, Grapes, Potato, Onions, Rhubarb, Strawberries, Raspberries. Crops such as tomatoes and peppers will drop their blooms and it can even mess up a peppers ability to produce properly. If the leaves of beans get frost-bitten it can stun them and actually slow down their ability to grown properly.

Frost will kill summer plants. If you do get caught with a late freeze you can cover your plants with newspaper, straw, or plastic. Tomatoes can be covered with 5 gallon buckets or grocery

bags but even these will not always protect the tender young plants from the cold. Every gardener learns this hard lesson sooner or later. If frost gets on your plants, you must get up before the sun and sprinkle water on your plants to wash off the frost. If the sun hits the frost, it is too late. The frost is a lethal poison to your plants and they will die.

Mulching summer plants, especially ones that produce all summer or are long growing such as cucumbers, squash, okra, tomatoes, potatoes, peppers, cantaloupe, watermelon or pumpkins. Good mulching reduces a lot of labor by helping to conserve moisture and reducing those hateful, nasty weeds. It also makes the garden pretty and in the fall provides humus to be worked into the soil.

Mulching materials:

Straw :

This is an excellent mulching material but the wheat or barley seeds in the straw will sprout and grow. It is best if the straw is allowed to get wet and go through a heat to kill the seeds before using.

Newspaper :

This is a way to recycle your newspaper! It will blow away if not weighted down. Some like to use it under the straw as an additional weed blocker.

Grass Clippings :

These are free for the getting and a way to dispose of that extra grass. Because it is a green clipping you may have to add extra nitrogen to help compensate for the nitrogen it pulls out of the ground.

Weed Blocker or Black Plastic :

Excellent protection but more expensive and has to be removed in the fall. Always use black plastic as it helps to block the sunlight. Be sure to punch holes in the plastic so water can penetrate.

Soil Analysis:

An accurate soil analysis is vital to understanding your soil. We use high quality laboratory analyses that work specifically for our system.

Before sending soil samples to us please check out Taking a Good Soil Sample and Sending Soil Samples to K.A.S.

From the basis of a detailed soil analysis, and plant tissue analysis when necessary, and - importantly - the additional information that you provide by completing the free soil test worksheet, we build a specific fertilizer recommendation for each soil sample, tailoring the recommendations to your particular operation and goals.

The recommendations will utilize the proven principles of the Kinsey/ Albrecht system of soil fertility management. The aim is to correct and raise the overall soil fertility to improve and maintain yields and/or crop quality. If we have previously made recommendations for the same soil location, and it has been properly identified as such, then these previous analyses and recommendations are taken into account also.

Samples originating outside of the U.S. and Canada require specific USDA clearance, and may also have to be priced differently according to the service you require - please contact us for the proper procedures, and information concerning cost of analysis and turn-around time before sending any soil.

Fertilizer Recommendations:

Our recommendation report for each sample has two parts: the soil analysis and recommendation for achieving the proper fertility level. The basic soil analysis will normally include:

Total Exchange Capacity (T.E.C.)

Soil pH

Organic Matter (Humus) as percent

Nitrogen (N released from colloidal humus)

Sulfate (Expressed as elemental sulfur) in ppm

Phosphates (as P205)

Olsen value (Included at no charge if pH is above 7.5)

Percent Base Saturation of:

Calcium, Magnesium, Potassium, Sodium, Other Bases Exchangeable Hydrogen Calcium, Magnesium, Potassium, and Sodium levels - in lbs/acre*

Trace elements:

Boron in ppm

Iron in ppm

Manganese in ppm

Copper in ppm

Zinc in ppm

Our recommendations for a specific plan of fertilizer amendments are tailored to your expressed short or long term goals, and take into account the previous history of crops and fertilizers at the location, farming conditions in the area, your type of operation, fertilizer preferences, and other factors, as supplied by the grower, in addition to the condition of the soil.

We do not sell fertilizers or soil amendments. It is suggested that to the extent possible you work locally to obtain materials from your preferred fertilizer dealership. Since each soil is tested in more detail than is customarily done in various areas, and provided as well with its own specific set of recommendations, some needed materials may not always be stocked by local dealers. This tends to be especially true for those striving to be certified organic growers.

Taking a Good Soil Sample:

The way the soil samples are taken is extremely important, as the recommendations you receive from soil tests will only be as good as the samples you send for analysis.

Following the instructions below will assure that the samples you send are taken in the way we need them for a proper analysis.

When to take a soil sample. Soil samples may be collected at any time of the year, provided that the area is not suffering from prolonged drought, that no nitrogen has been applied in the last 30 days and no sulfur has been used in the last six months. Late spring and early summer sampling avoids the rush, shows the soil's fertility at its best and gives time to plan a soil fertility program which can begin directly following harvest if necessary.

However, if no samples have been taken within the last two years, the best time to sample is as soon as circumstances permit. Generally, sampling should be done every year if fertility is high and / or trace elements are being used to achieve top yield from year to year and is useful at the time of fertilization

Collecting the Sample(s):

The sample bag: Use a new soil-sample container, plastic bag or plastic container.

Soil-sample bags are available free from Kinsey Agricultural Services. Zip-loc bags are fine as long as they have never been used - but put Scotch tape over the writing or attach masking tape to write on because all types of marking ink can rub off the bag during shipment. Do not use paper sacks from the grocery store, bread wrappers, or such items, due to possible contamination. Avoid using a plastic bucket that has been used for other purposes. Even repeated washings of a bucket used to mix salt and minerals for feed can still result in contamination of the sample.

Label the sample bags with your name, the farm name if any, field number and sample area.

Prepare a map or sketch of the area for your own records. Make sure the labeling on the bag matches the number of the field and area on your map. Labeling the bags to match the areas before taking the sample helps.

A SOIL PROBE is recommended for easiest and best sampling results. Using a soil probe or shovel, sample down to a depth of 6½ -7 inches (17cm), or to the depth the soil will be thoroughly mixed when worked if that will be deeper than 6½ -7 inches. For no-till crops, orchards, vineyards, pastures, hay meadows, lawns, etc., where soils will not be worked, the depth should be 4 inches (10cm). Sampling to the proper depth is extremely important if we are to provide each grower with the correct recommendations. Put the soil, using several probes from like areas to make up the sample, into the sample bag.

Removal of obvious debris (roots, leaves, etc.) is fine but unnecessary as it will not adversely affect the sample. If you do remove debris from the sample, be careful that none of the actual soil is removed with it.

Probe the soil every 50 to 100 paces, always taking a minimum of 5 probes per composite sample for smaller areas, and one probe for every 1 (one) to 2 (two) acres from larger areas.

Only a small amount of soil is necessary for analysis. A cupful of soil is more than enough. Just be sure your sample represents the entire soil profile, if mixed, in order to send only a small portion. Please remember : this will be a very detailed analysis, which will only be as accurate as the sample you send.

FERTILIZERS:

Nitrogen is a primary nutrient that really makes plants "grow." When you put fertilizer on your lawn, most of the "green-up and grow" comes from the nitrogen.

There are 'quick release' and 'slow release' forms of nitrogen. Slow release forms are more expensive but remain effective for a longer period of time. Organic fertilizers are slow release, and have less potential to "burn" plants.

Nitrogen produces vegetative growth in plants, but too much nitrogen can cause problems. One problem is succulent growth, which makes a plant more susceptible to certain diseases. 78% of our atmosphere is nitrogen, and rain and snow account for 2 to 12 pounds of actual nitrogen per acre (43,560 square feet), per year. "Lightning charged rain" is high in NH_4 and NO_3 . Snow has been called "poor man's manure". . . now you know why!

Plants in the Legume family "fix" atmospheric nitrogen into the soil. Peas, beans, clover, and alfalfa are legumes, as well as Black Locust trees.

PHOSPHORUS (P) - the Phosphorus percentage is the middle number on the label

Example: 10-10-10

Phosphorus is a primary nutrient that encourages rooting, blooming and fruit production in plants.

Vegetable gardeners have typically been told to apply 5-10-5 since the higher middle number (P) helps vegetable production.

Phosphorus is important for root-growth and blooming in plants, and is the main ingredient in "starter fertilizers" as well as liquid fertilizer "bloom boosters". Phosphorus is lacking in most Southwestern Pennsylvania soils we have tested since 1979. Applications of super-phosphate 20-0), triple super-phosphate (0-46-0), or bone meal (organic source) can be used to correct deficiencies.

Since phosphorus moves very slowly through the soil, it should be incorporated into the soil prior to, or during planting. In existing lawns, we recommend core-aeration prior to phosphorus application.

POTASSIUM (K) - the Potassium percentage is last on the label

Example: 10-10-10

Potassium helps plants resist disease and aids in winter hardiness. ("K" is the symbol for "kalium" or potash, and is commonly used to represent potassium) Most 'winterizer' fertilizers used on lawns in late fall are high in Potassium, since it promotes winter hardiness in turfgrasses. Potassium fertilizers have a high "salt index" and should be used with caution, since they can "burn" plant foliage. Most "complete" fertilizers contain potassium since it is fairly mobile, and readily leaches out of the soil profile.

Secondary Nutrients:

Secondary nutrients also play an important role in plant growth. The 3 secondary nutrients are Calcium (Ca), Magnesium (Mg) and Sulfur (S).

Essential Elements:

The essential elements are basic to plant growth, and need to be mentioned here, even though they aren't commercially available fertilizers. The 3 essential elements are Carbon (C), Hydrogen (H) and Oxygen (O). Plants obtain these elements from carbon dioxide (CO₂) and water (H₂O).

Macronutrients:

When you group the essential elements with the major nutrients and secondary nutrients, you end up with the 9 macronutrients: Carbon, Hydrogen, Oxygen, Nitrogen, Phosphorus, Potassium, Calcium, Magnesium, and Sulfur: C, H, O, N, P, K Ca, Mg, S

Minor Elements:

Nutrients needed by plants in lesser amounts are known as the minor elements. These include Iron (Fe), Boron (B), Manganese (Mn), Copper (Cu), Chlorine (Cl), Molybdenum (Mo), and Zinc

Information about Soils:

Sandy soil:

All root vegetables like carrots, turnip, beetroot , coconut, cashew also grow.

Herbs:

Chamomile, lavender, thyme, semary, armeria, santolina, saxifrage also grow. In rajasthan soil and vegetation, sugarcane and cotton grows more. Wheat, mustard, maize, fruits, barley available in sandy soil.

Red Soil:

Found in states of AP, Tamilnadu, Orissa, goa, Maharashtra, Karnataka. Red soil has iron content and is fit for crops like redgram, bengalgram, groundnut and castorseed, millets, rice, maize, soyabean, pigeonpea, jute, tea, grapes, banana, papaya and mango, cashew.

Black soil:

Black soil is rich in potassium, calcium and magnesium crops like cotton, tobacco, chilly, oilseeds, jowar, ragi and maize grow covers an area of about 74 million. Suitable for cotton crop other crops are potato, groundnut, sugarcane, soyabean and wheat.

Alluvial soil:

Covers about 75 million acres and distributed in states of Punjab, Haryana, Uttaranchal, Bihar, West Bengal, Uttarpradesh. Crops grow in it are rice, wheat, mustard, jute, sunflower, tomato, maize.

Desert soil:

Cover an area of about 29 million acres. millets, fooder, pulses are the main crops.

Peaty and Marshy soils:

Found in kerala, Orissa, Tamilnadu, West Bengal. These soils often produce a very good rice crop.

3. Requirement Analysis

3.1 Purpose and Scope:

- **Purpose:**

It is an open discussion portal used for farmers and agricultural students for knowing the information about various crops, and in which soil they grow more, and the usage of fertilizers to the crops. If necessary training is given to the students and farmers.

- **Scope:**

- Providing accessibility to all users who have a valid userID and password.
- Generating monthly and daily reports of the market
- User can post query. They can see answers only after they have logged in.
- Communication is provided for the user through mails.

3.2 Users of the system:

- Farmers and agricultural students
- General public
- Administrator
- Agricultural officers

4. Specific Requirements

4.1 Functional and Non- Functional Requirements:

Functional Requirements:

- Individual profile management for all kind of users.
- Basic soil analysis for all regions and suggestions on which fertilizers to use where & how much? Which crop, herb or vegetable can be grown where and in which season?
- Online query handlings for all users. Queries can be general or directed to a particular officer.
- Officers/NGOs can schedule trainings and publish it online. General public, farmers and agriculture students can request training online.
- Facilitate communication between user, experts and general public through mails.
- Information about major crop markets (mandi) and their current price for crop should be published daily.
- Information pages should be dynamic so that agriculture officers and administrator can change it from their interface easily.

Non-functional Requirements:

- Secure access of confidential data (user's details).
- 24 X 7 availability
- Better component design to get better performance at peak time
- Flexible service based architecture will be highly desirable for future extension

4.2 User Interface Requirements:

- Professional look and feel
- Browser testing and support for IE.
- Reports exportable in .XLS or any other desirable format.

4.3 System Architecture:

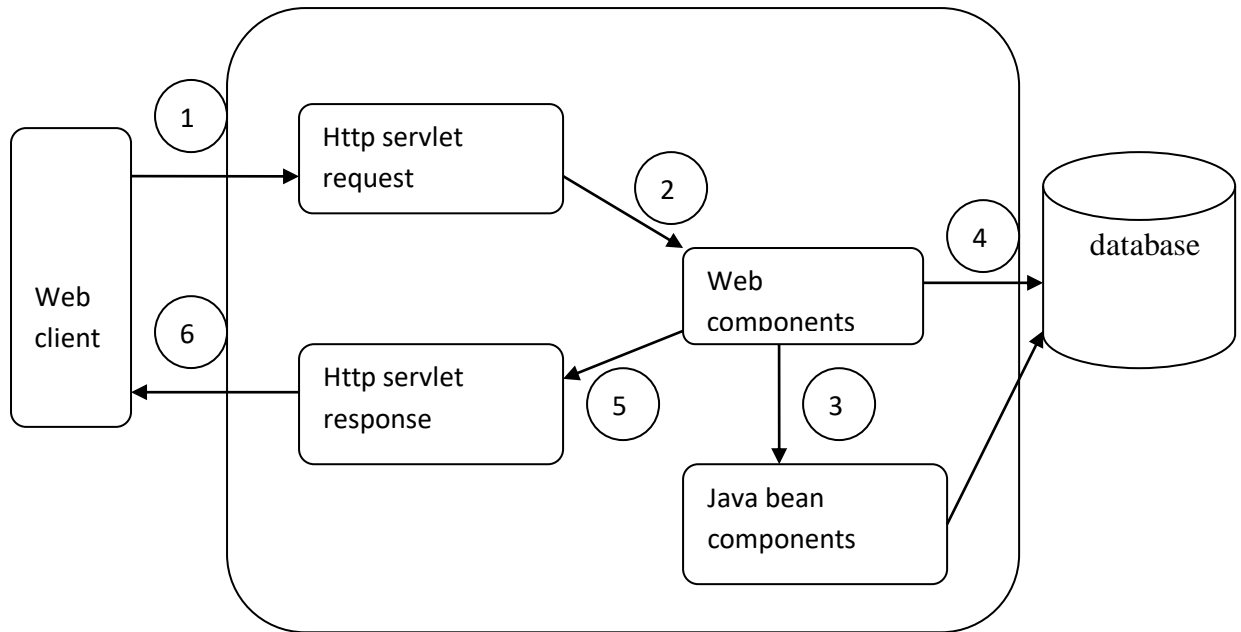


Figure 1: System Architecture

5. System Requirements

5.1. Technologies Used:

- UML
- Java script
- J2EE
- Servlets
- JSP
- HTML

UML:

The Unified Modeling Language (UML) is an open method used to specify, visualize, construct and document the artifacts of an object-oriented software-intensive system under development. UML offers a standard way to write a system's blueprints, including conceptual components such as:

Actors, Business processes and System's components and activities.

Java script:

JavaScript is a script-based programming language that was developed by Netscape Communication Corporation. JavaScript was originally called Live Script and renamed as JavaScript to indicate its relationship with Java

J2EE:

Java Platform, Enterprise Edition or Java EE is a widely used platform for server programming in the Java programming language

Servlets:

The Java web server is JavaSoft's own web Server. The Java web server is just a part of a larger framework, intended to provide you not just with a web server, but also with tools. To build customized network servers for any Internet or Intranet client/server system. Servlets are to a web server, how applets are to the browser.

HTML:

HTML, an initialism of Hypertext Markup Language, is the predominant markup language for web pages. It provides a means to describe the structure of text-based information in a document.

5.2 Tools used:

- Oracle 10G
- Tomcat 5.0
- Rational Rose Enterprise Edition
- EDRAW

Oracle 10g:

The Oracle Database (commonly referred to as Oracle RDBMS or simply Oracle) consists of a relational database management system (RDBMS) produced and marketed by Oracle Corporation. Oracle had become a major presence in database computing.

Database:

A database management system (DBMS) is computer software designed for the purpose of managing databases, a large set of structured data, and run operations on the data requested by numerous users.

Tomcat 5.0:

Apache tomcat is an open source servlet container developed by the apache software foundation (ASF). Tomcat implements the java servlet and JSP specifications from sun micro system, and provides a pure java HTTP web server environment for java code to run.

Tomcat should not be confused with the Apache web server, which is a C implementation of an HTTP web server; these two web servers are not bundled together. Apache tomcat includes tools for configuration and management, but can also be configured by editing XML configuration files.

EDRAW:

Edraw helps you to create professional-looking diagrams such as flowcharts, organizational charts, network diagrams, business diagrams and more for understanding, documenting, and analyzing information and presenting.

6. System Design

6.1 Data Flow Diagrams:

ER-DIAGRAM:

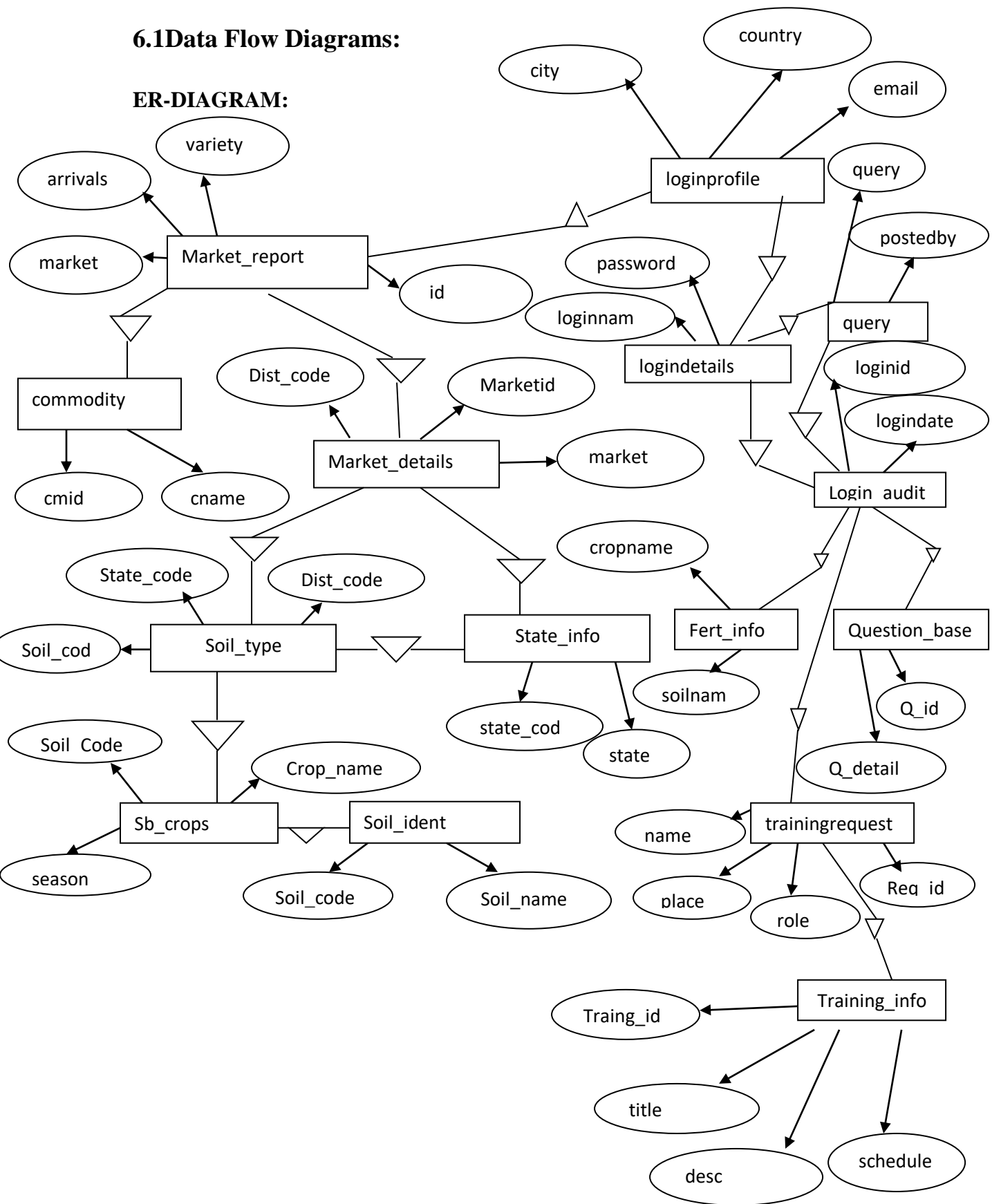


Figure 2: ER-Diagram

6.2. Behavioral Diagrams:

6.2.1. Use Case Diagram:

Use case Diagrams represent the functionality of the system from a user's point of view. Use cases are used during requirements elicitation and analysis to represent the functionality of the system. Use cases focus on the behavior of the system from external point of view.

Actors are external entities that interact with the system. Examples of actors include users like administrator, farmers, agriculture students etc., or another system like central database.

Description:

Name of the Use Case: login

Description:

Every user should login to access the services provided by farmers buddy system.

Pre Condition: Each user must have a valid user id and password.

Post Condition: Home Page will be displayed.

Flow of events:

- Invoke the Login page.
- Enter the valid User ID and Password.
- Click on Login button to access Home page.

Name of the Use Case: Registration

Description:

Every new user can register by clicking on "register now" link.

Post condition: Registration page is displayed.

Flow of events:

- Invoke the Login page.
- Click on register now, link to access Registration page.

Name of the Use Case: soil

Description:

In this, we add information about various soils that are available and also we can update, delete the information about soils. User after registered with this system can view this information provided.

Pre Condition: Each user must have a valid user id and password.

Post Condition: Required Page will be displayed.

Flow of events:

- We can add soils into the system
- We can update and delete soil information

Name of the Use Case: crop

Description:

In this, we add information about various crops that are available and also we can update, delete the information about crops to be grown in various soils according to climatic conditions. User after registered with this system can view this information provided.

Pre Condition: Each user must have a valid user id and password.

Post Condition: Required Page will be displayed.

Flow of events:

- We can add crop information into the system
- We can update and delete crop information

Name of the Use Case: fertilizer

Description:

In this, we add information about various fertilizers that are available and also we can update, delete the information about fertilizers to be used in various soils according to climatic conditions. User after registered with this system can view this information provided.

Pre Condition: Each user must have a valid user id and password.

Post Condition: Required Page will be displayed.

Flow of events:

- We can add fertilizer information into the system
- We can update and delete fertilizer information

Name of the Use Case: commodity

Description:

In this, we add, update and delete the information about various commodities that are available in markets corresponding to particular areas in particular state and district. User after registered with this system can view this information provided.

Pre Condition: Each user must have a valid user id and password.

Post Condition: Required Page will be displayed.

Flow of events:

- We can add commodity information into the system
- We can update and delete commodity information

Name of the Use Case: market

Description:

In this, we add, update and delete information about various markets. User after registered with this system can view this information provided.

Pre Condition: Each user must have a valid user id and password.

Post Condition: Required Page will be displayed.

Flow of events:

- We can add market information into the system
- We can update and delete market information

Name of the Use Case: reports

Description:

In this, we generate reports regarding crops, soils, fertilizers, markets, commodities and about their prices in a particular state or district daily or month wise reports to be published.

Pre Condition: Each user must have a valid user id and password.

Post Condition: Required Page will be displayed.

Flow of events:

- We can add reports information about markets, fertilizers, crops, soils, commodities into the system

Name of the Use Case: mails

Description:

Communication is provided in this system through mails which includes the query posting regarding information about crops, soils, fertilizers, commodities, markets.

Pre Condition: Each user must have a valid user id and password.

Post Condition: Required Page will be displayed.

Flow of events:

- We can compose mails
- We can view sent mails

Name of the Use Case: security

Description:

Providing Security by entering valid username and password. Security question is asked whenever user forgets password.

Pre Condition: Each user must have a valid user id and password.

Post condition: Required Page will be displayed.

Flow of events:

- Whenever the user forgets password, the user is asked with security question.
- If the user doesn't provide correct user name and password, the user cannot enter into the system

Name of the Use Case: training

Description:

Training is scheduled regarding information about crops, soils, fertilizers, commodities, markets.

Pre Condition: Each user must have a valid user id and password.

Post condition: Required Page will be displayed.

Flow of events:

- We can add training information into the system
- We can view trainings information.

Name of the Use Case: queries

Description:

A query is posted by users regarding any information they required.

Pre Condition: Each user must have a valid user id and password.

Post condition: Required Page will be displayed.

Flow of events:

- We can add queries into the system
- We can view queries and answers for the queries.

Name of the Use Case: logout

Description:

After using the information available with this site, users logout of this system.

Pre Condition: Each user must have a valid user id and password.

Flow of events:

- When the user is logged out of the system, the user goes to login page again

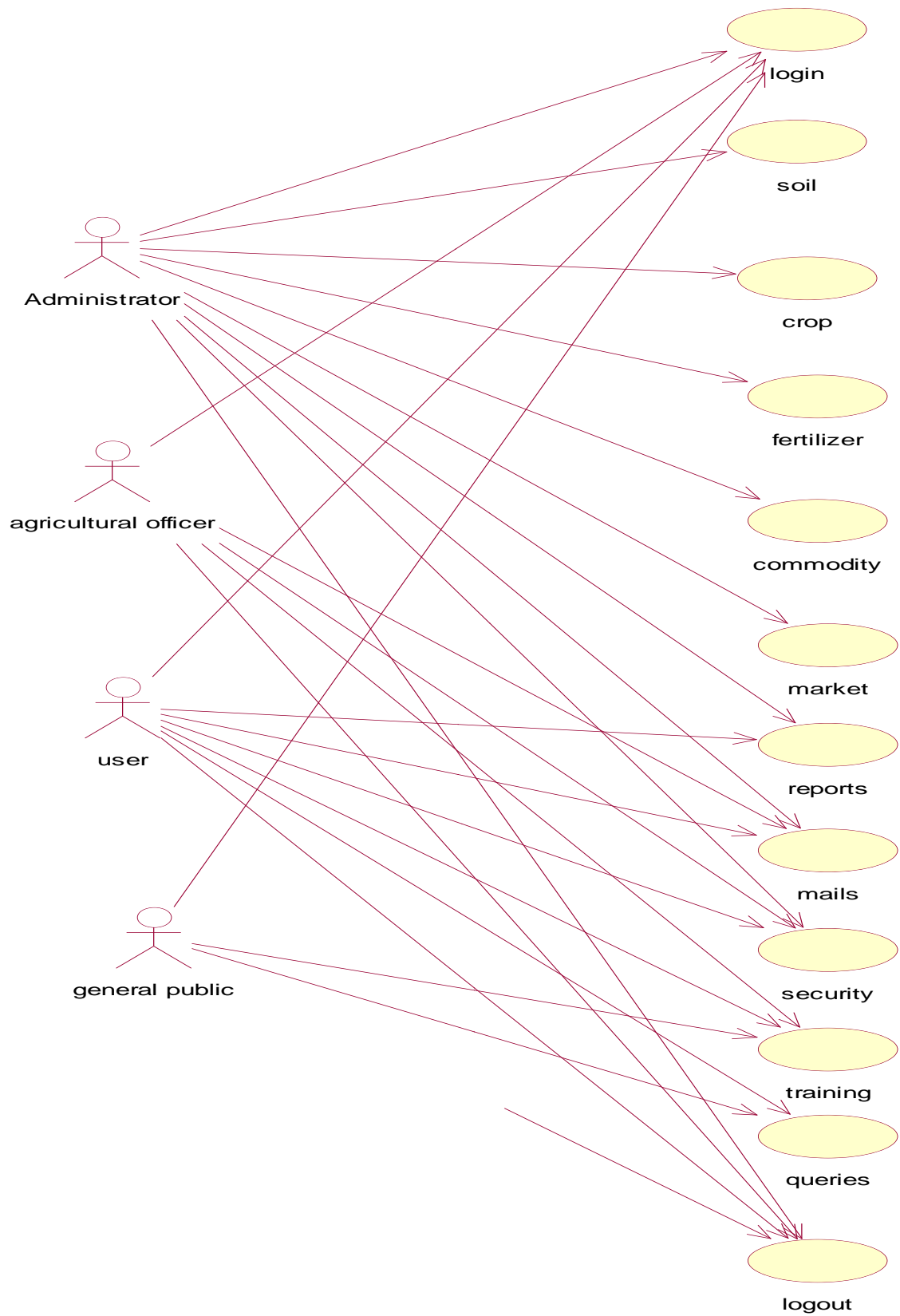


Figure 3: Use Case Diagram

6.2.2 Class Diagram:

A class diagram is an illustration of the relationships and source code dependencies among classes in the unified modeling language. In this context, a class defines the methods and variables in an object, which is a specific entity in a program or the unit of code representing that entity.

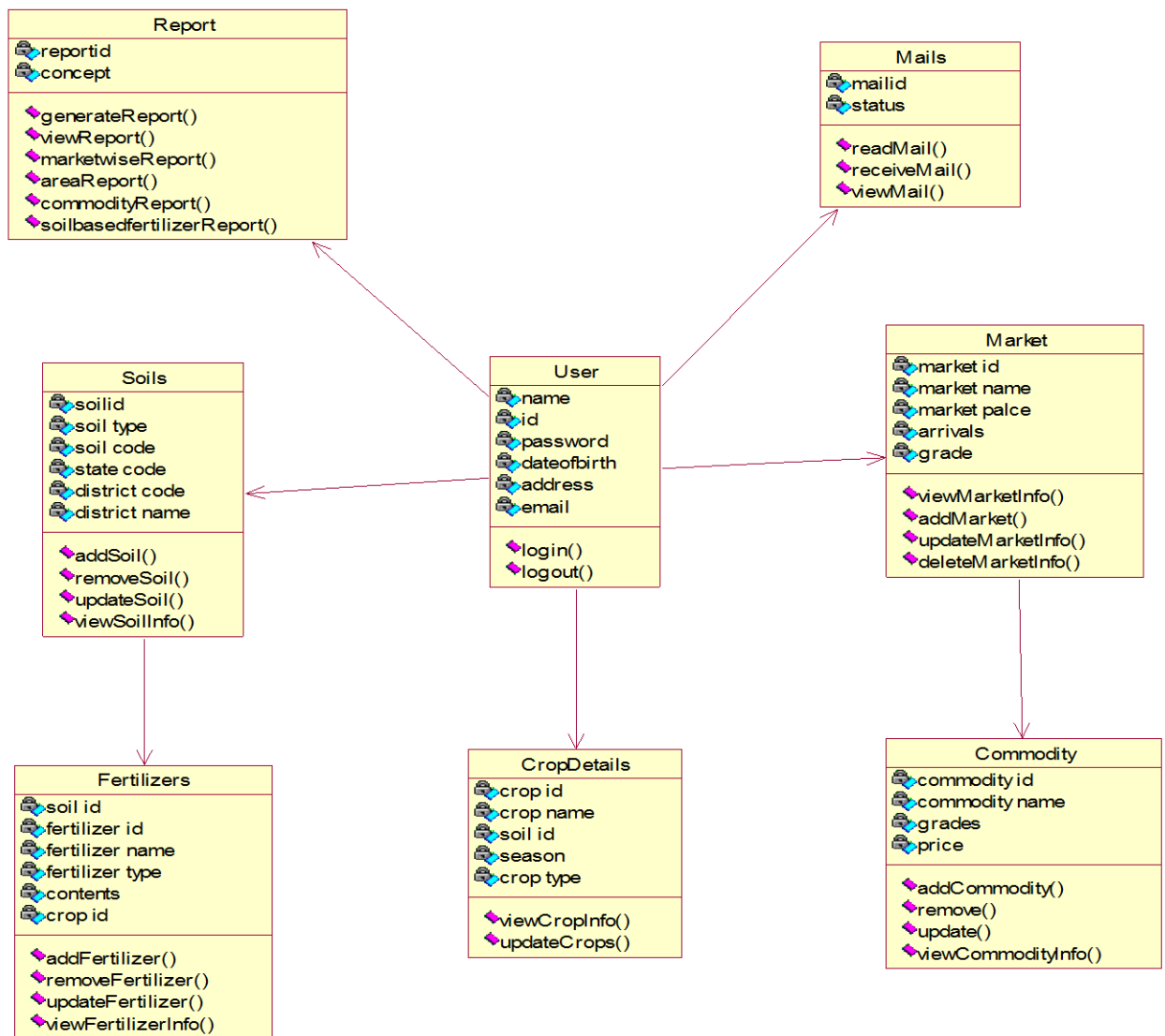


Figure 4: Class Diagram

6.2.3 Sequence Diagrams:

Sequence diagram is a diagram that shows object interactions arranged in time sequence. In particular it shows objects participating in the interaction and the sequence of messages exchanged.

1.Administrator:

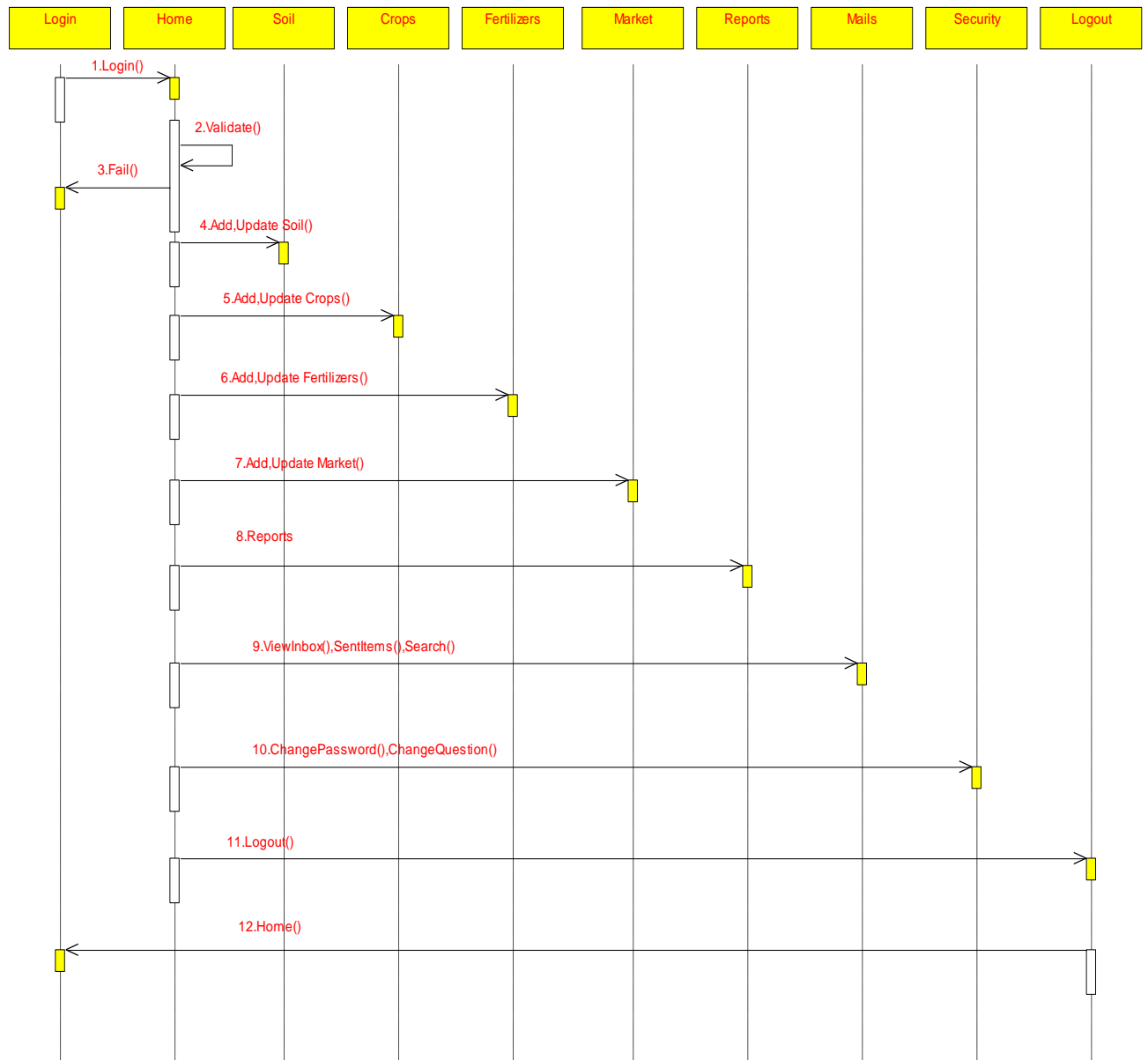


Figure 5.1: Sequence Diagram for administrator

2 . User:

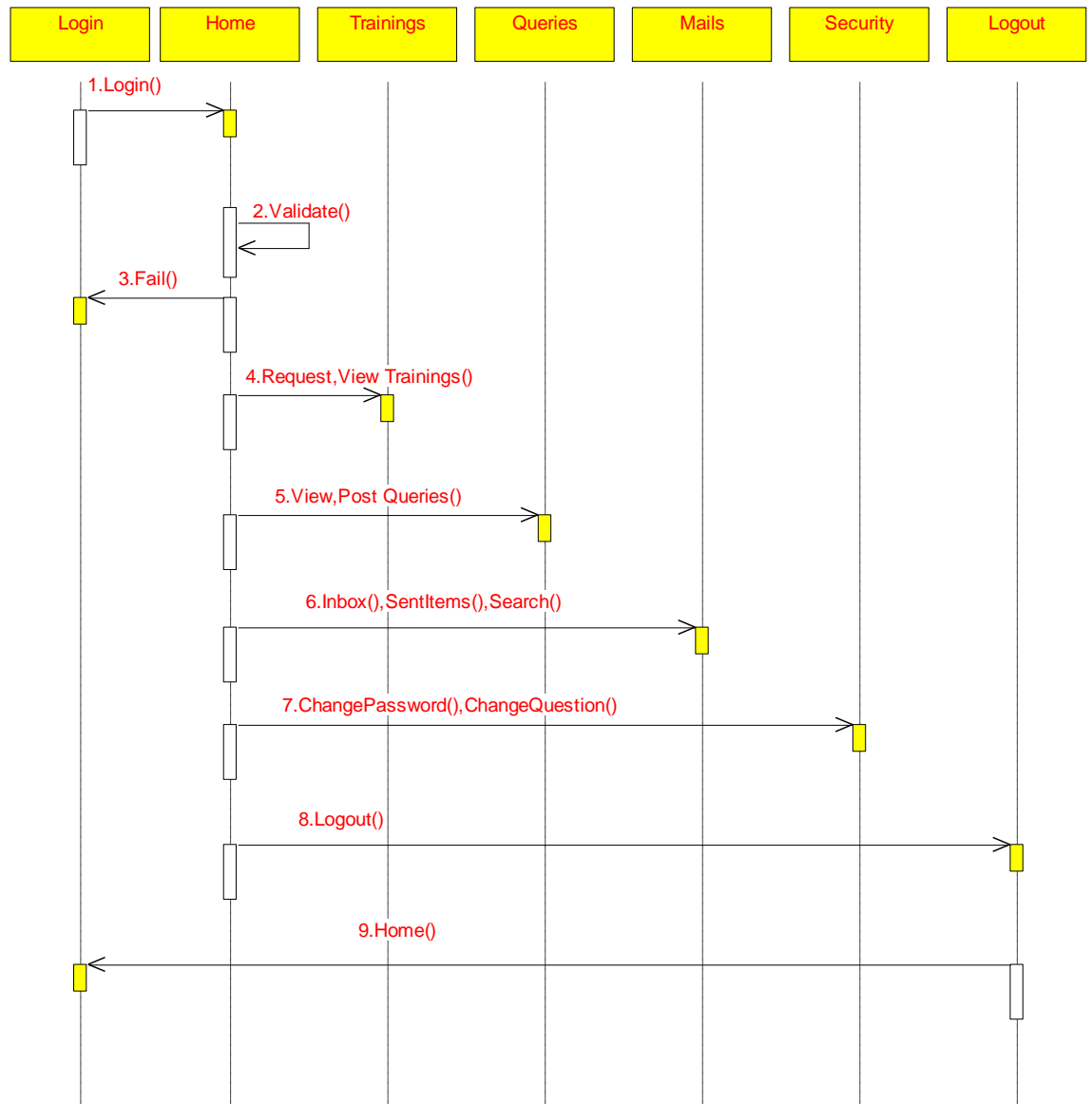


Figure 5.2: Sequence Diagram for user

3.Agricultural Officer:

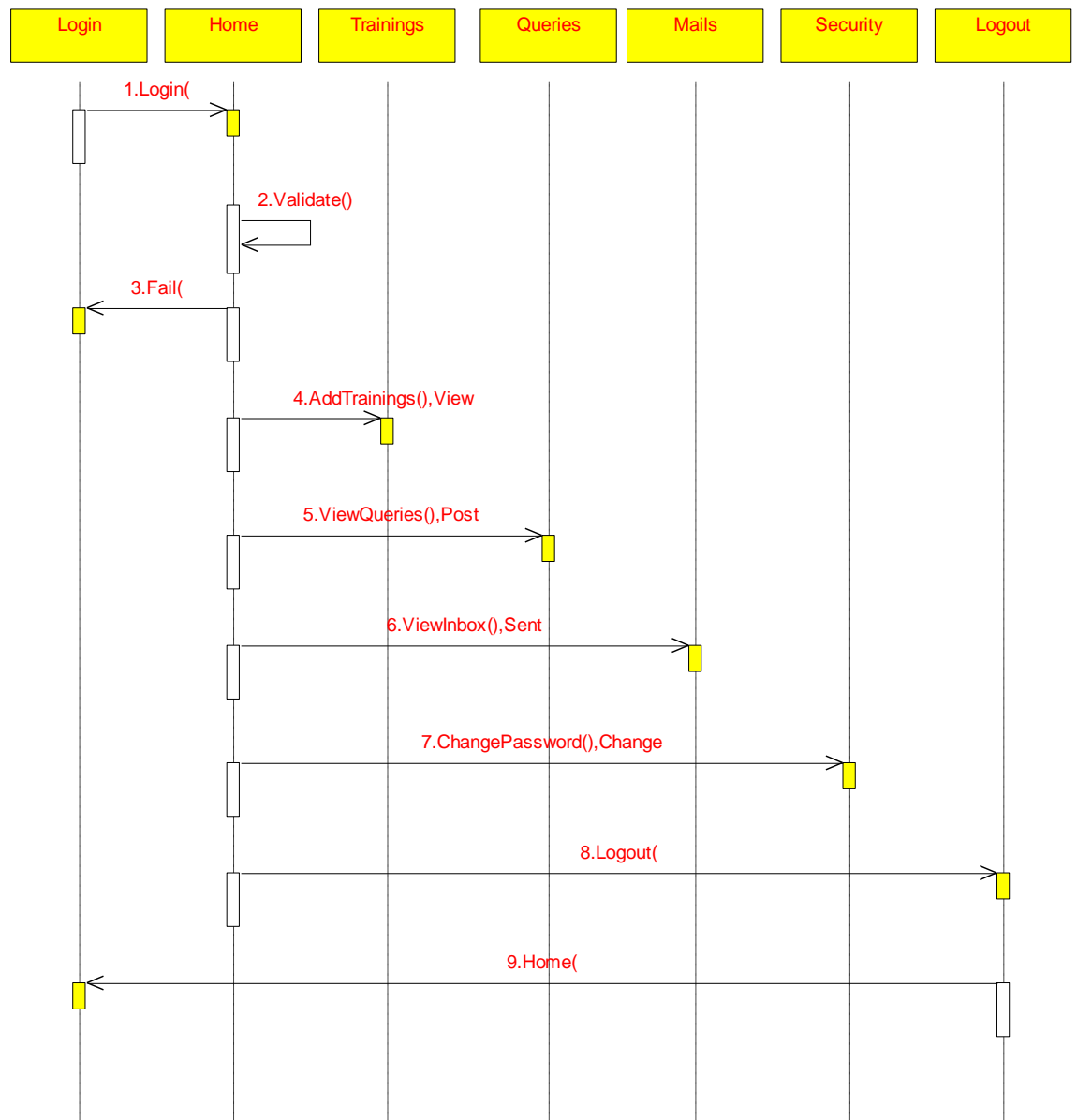


Figure 5.3: Sequence Diagram for agricultural officer

4.General Public:

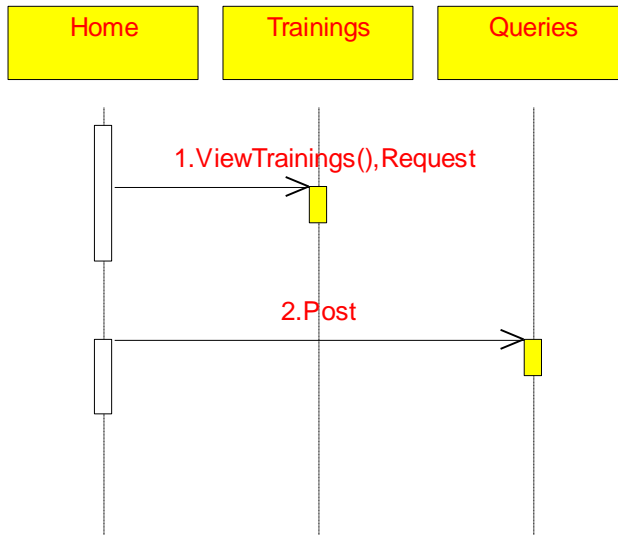


Figure 5.4: Sequence Diagram for general public

6.2.4 Collaboration Diagrams:

A collaboration diagram also called a communication diagram or interaction diagram is an illustration of the relationships and interactions among software objects in the unified modeling language.

1.Administrator

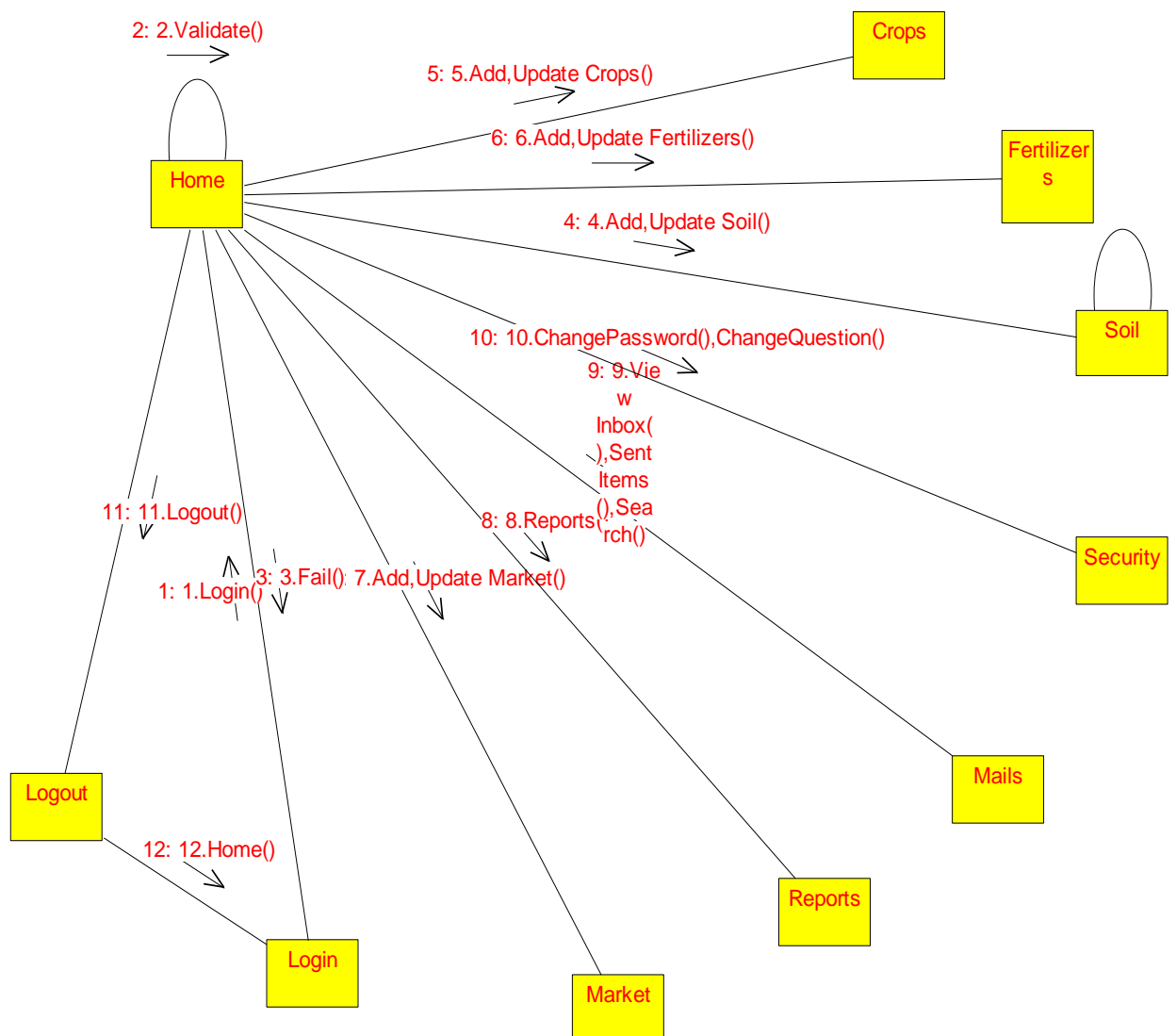


Figure 6.1: Collaboration Diagram for administrator

2.User

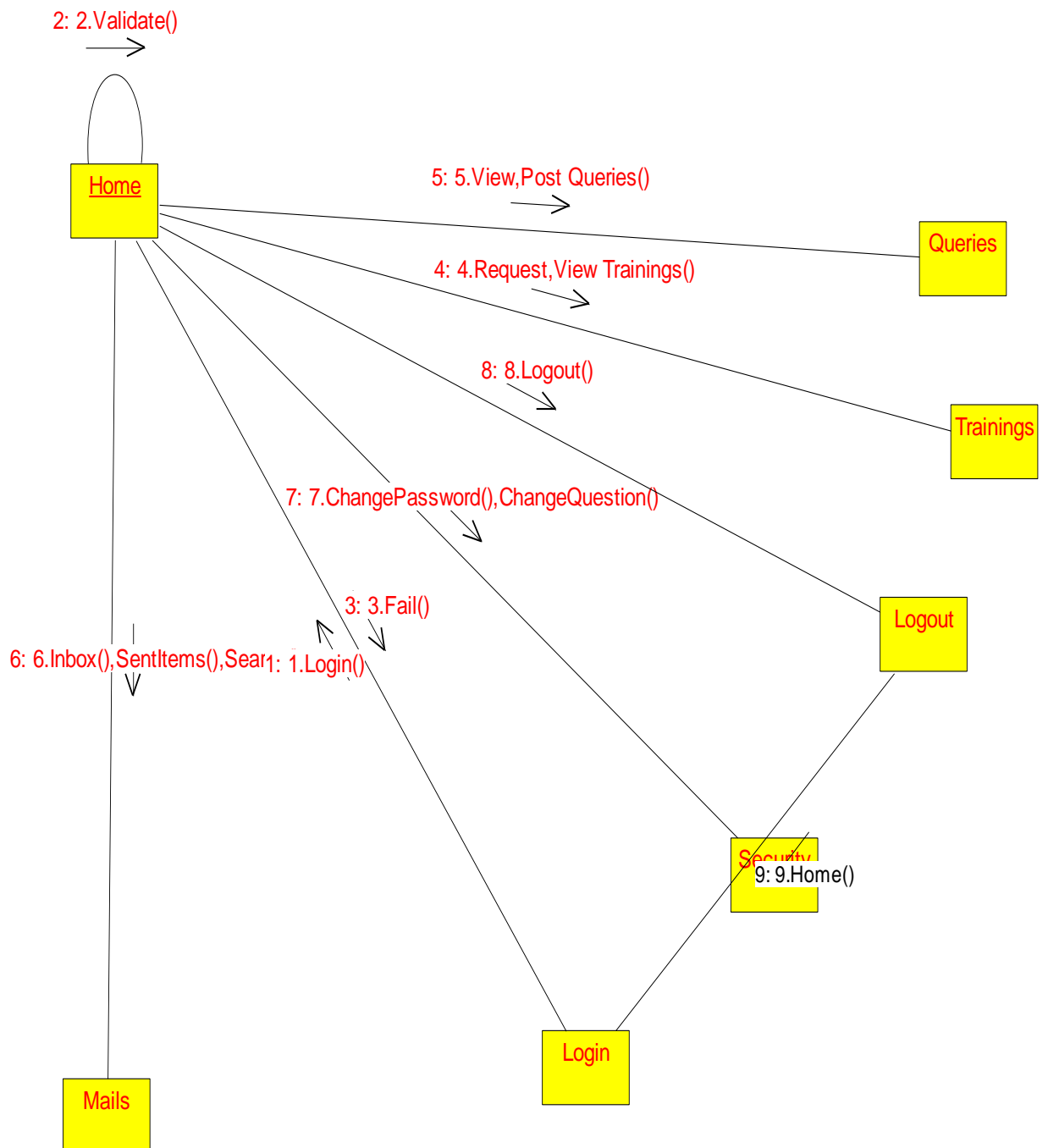


Figure 6.2: Collaboration Diagram for user

3.Agricultural Officer

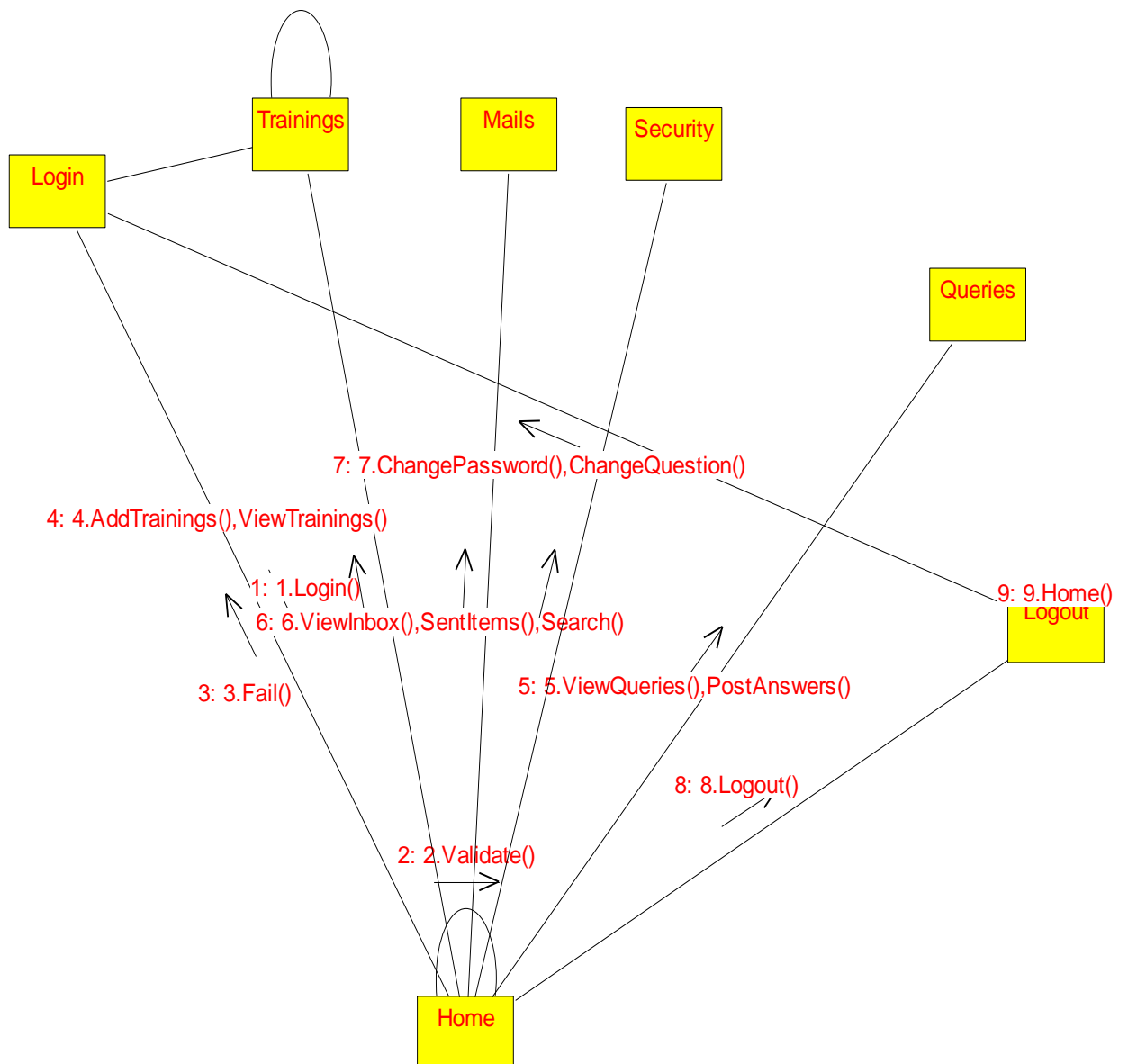


Figure 6.3: Collaboration Diagram for agricultural officer

4.General Public

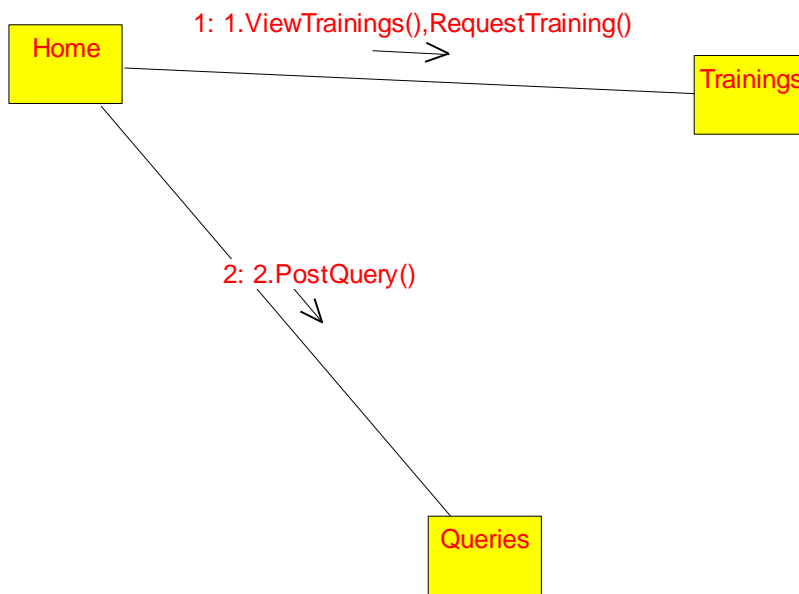


Figure 6.4: Collaboration Diagram for general public

6.2.4 Activity Diagrams:

Administrator:

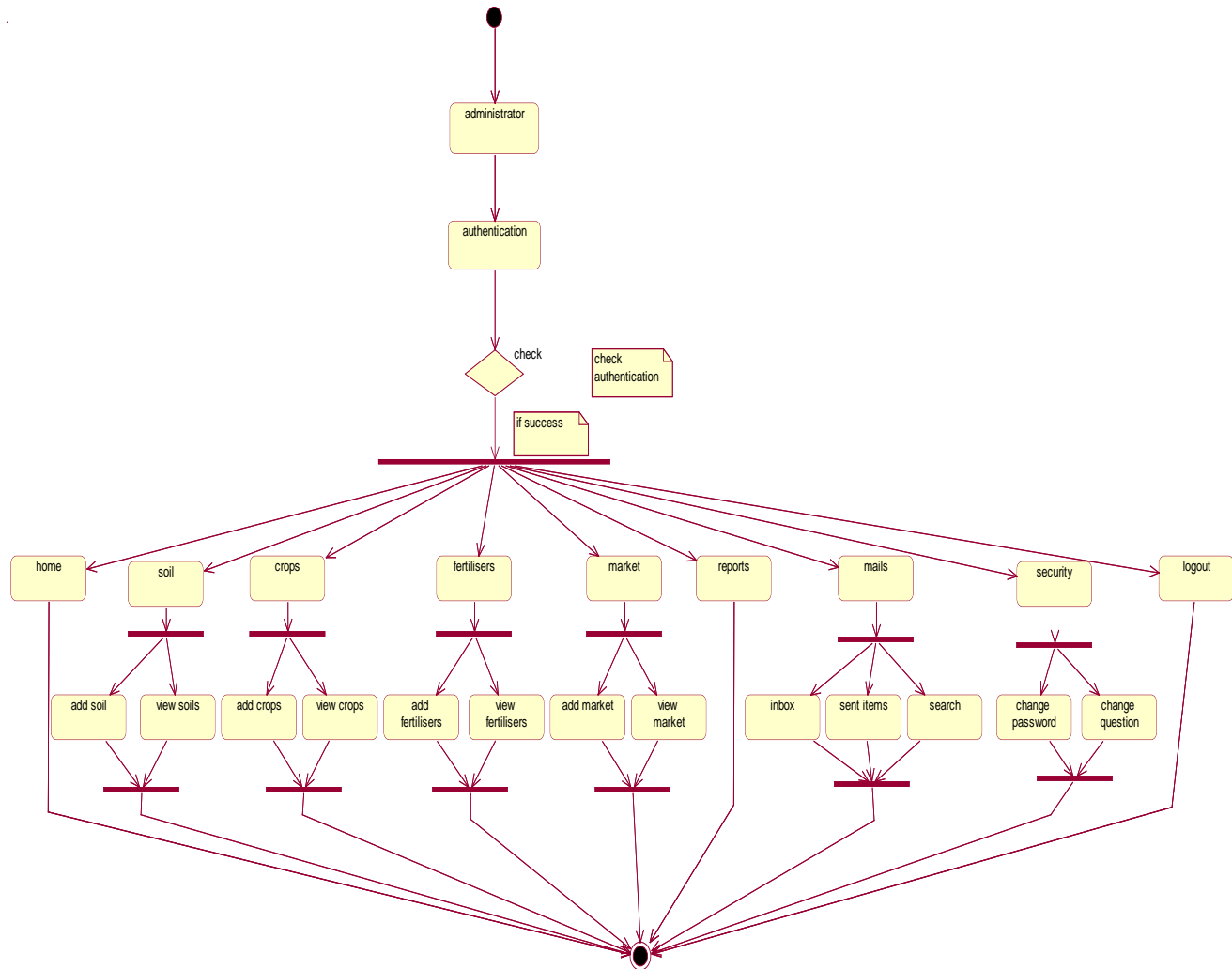


Figure 7.1: Activity Diagram for administrator

User:

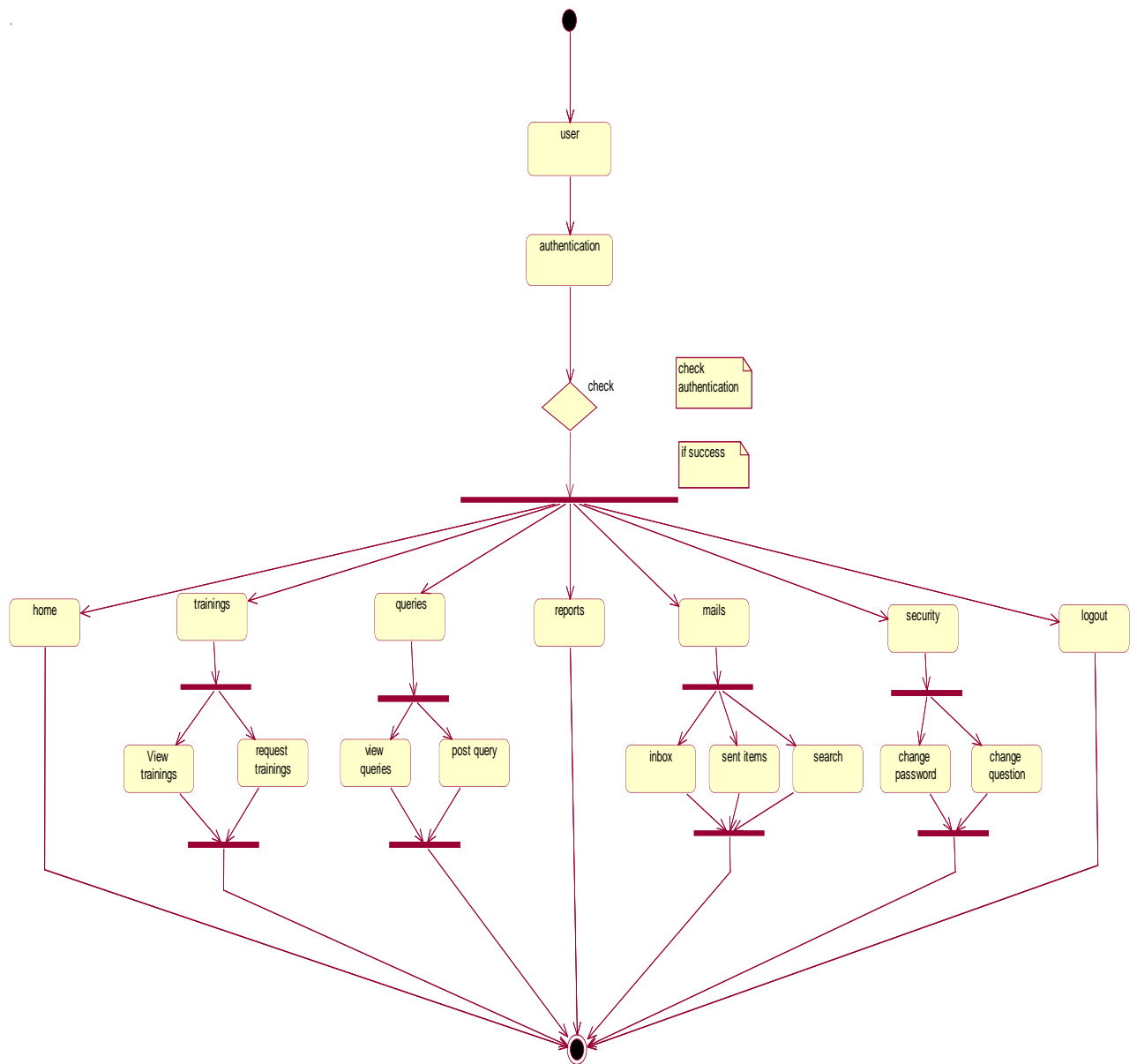


Figure 7.2: Activity Diagram for user

Agricultural Officer:

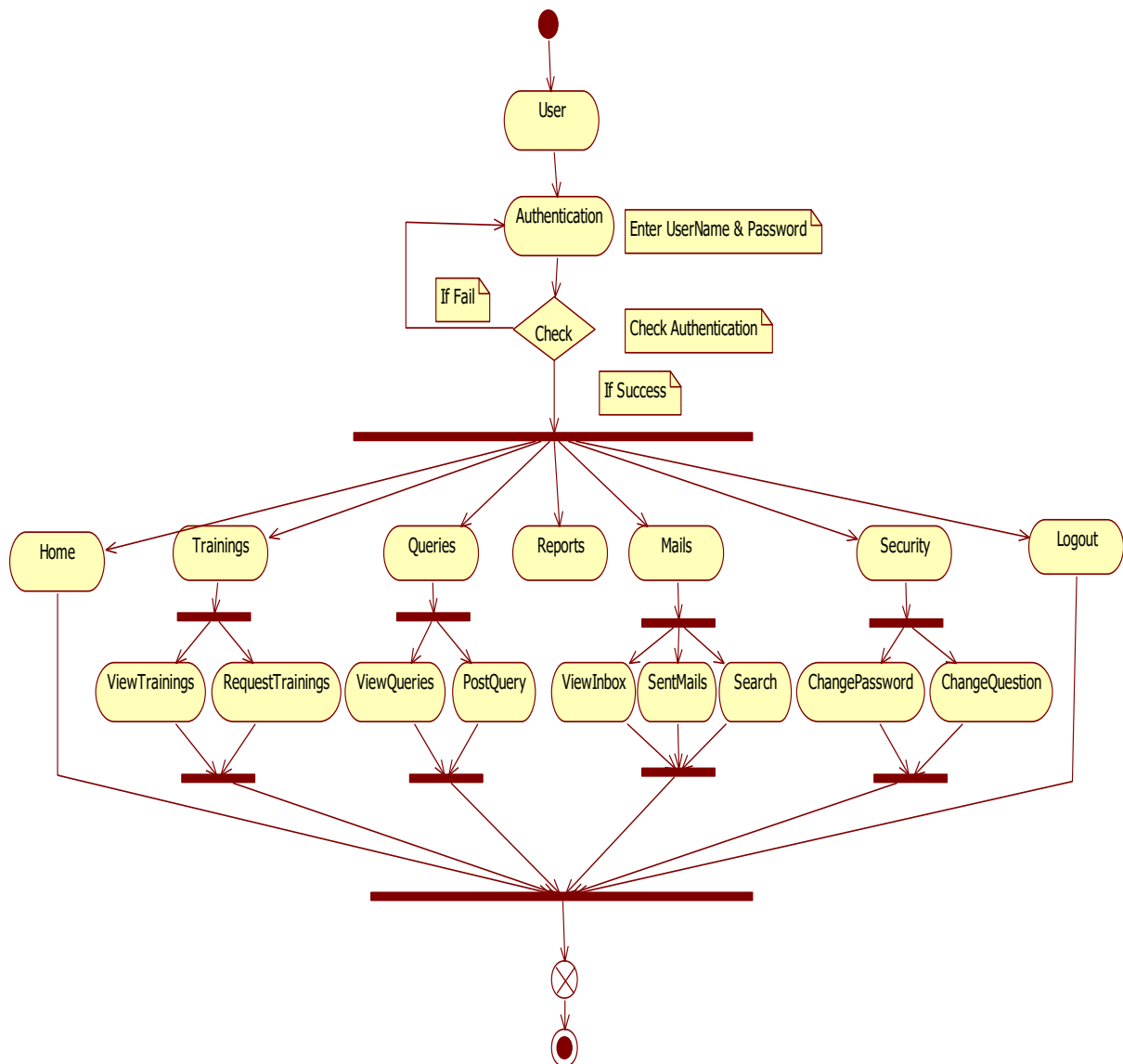


Figure 7.3: Activity Diagram for agricultural officer

6.2.6 Component Diagram:

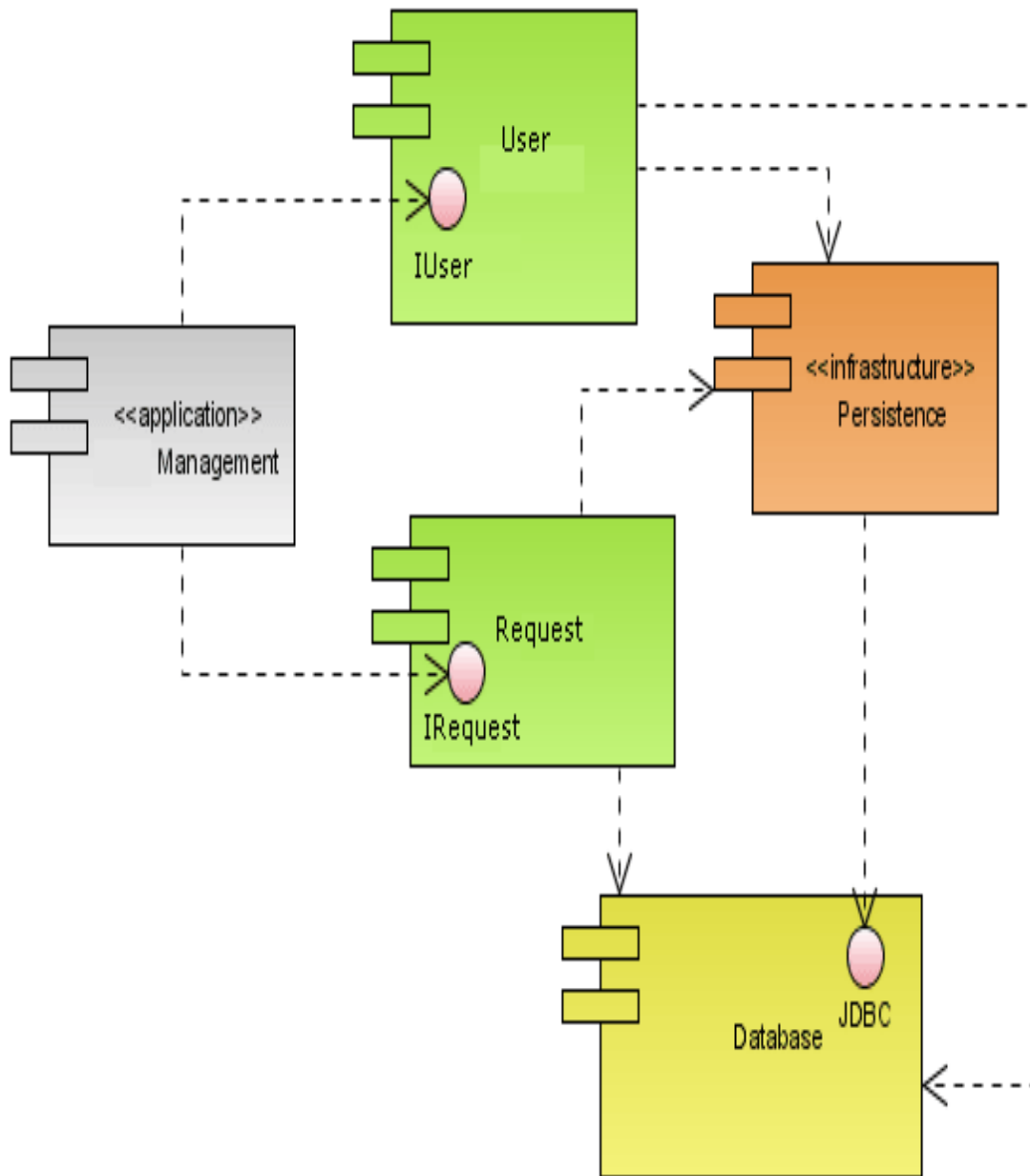


Figure 8: Component Diagram

6.2.7 Deployment Diagram:

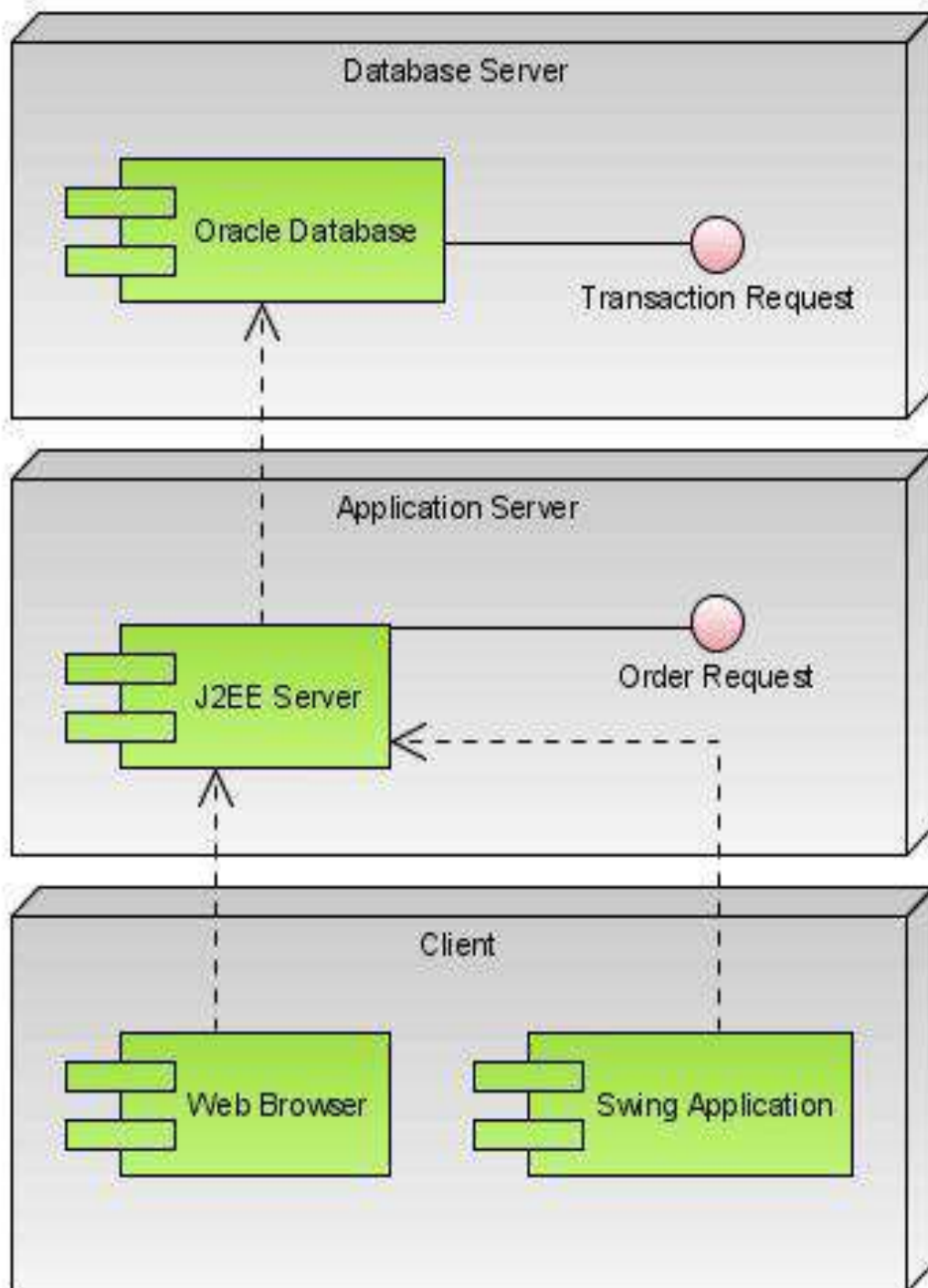


Figure 9: Deployment Diagram

6.3 System Specific Modules:

It has been modularized into following modules:

1. User Module
2. Soils and Fertilizers
3. Crop Details
4. Market Details
5. Reports
6. Mails

1. User Module:

First, to enter this system the users has to login to this system. Basically there are 3 types of users in this system.

- Admin users - Has full access to all the modules of this system.
- Farmers and Agriculture Students – Has restricted access. i.e., Normal users have access to some of the modules only.
- Agricultural officers: Has also restricted access.

2. Soils and Fertilizers:

This module is used to maintain the various Soils and Fertilizers Details. This module will be enabled only to the admin type of users.

This module contains:

- A separate screen should be provided to maintain the Soils and Fertilizers Details. It should provide a way to add, modify and delete the both details.
- If a new Soil Information is received it should be added to the System.
- If a new Fertilizer information is received it should be added to the system with the corresponding details like soil name, crop type, crop name etc.

3.Crop Details:

This module is used to maintain the various details about crops. This module will be enabled only to the admin type of users.

This module contains:

- A separate screen should be provided to maintain the Crops Information. It should provide a way to add, modify and delete the crop details.
- If a new crop information is received, it should be added to the system with the corresponding details like Soil Name, Crop Type, Crop Name and Season.

4.Market Details:

In this module we can maintain the market details. This module will be enabled only to the admin type of users.

This module contains:

- A separate screen should be provided to maintain the market related information. It should provide a way to add, modify and delete the market related information.
- Administrator type of user can add the commodities in the market.
- He can add the information about new markets into the system.
- He can add the market report into the system regarding a particular market and commodities prices details in that market in a day.

5.Reports

This module is used to prepare various online reports.

- Area Wise Crops report – This contains various information about the crops in a particular district.
- Soil Based Fertilizers report – This contains various information about the fertilizers based on the state, district, crop type and season.
- Commodity Wise report – This gives the different details about a particular commodity in a particular state and district.
- Market Wise Daily report – This gives the daily information about the various Markets in a particular state and district.
- Market Wise Monthly report – This report gives the market information in state and district in a particular month.

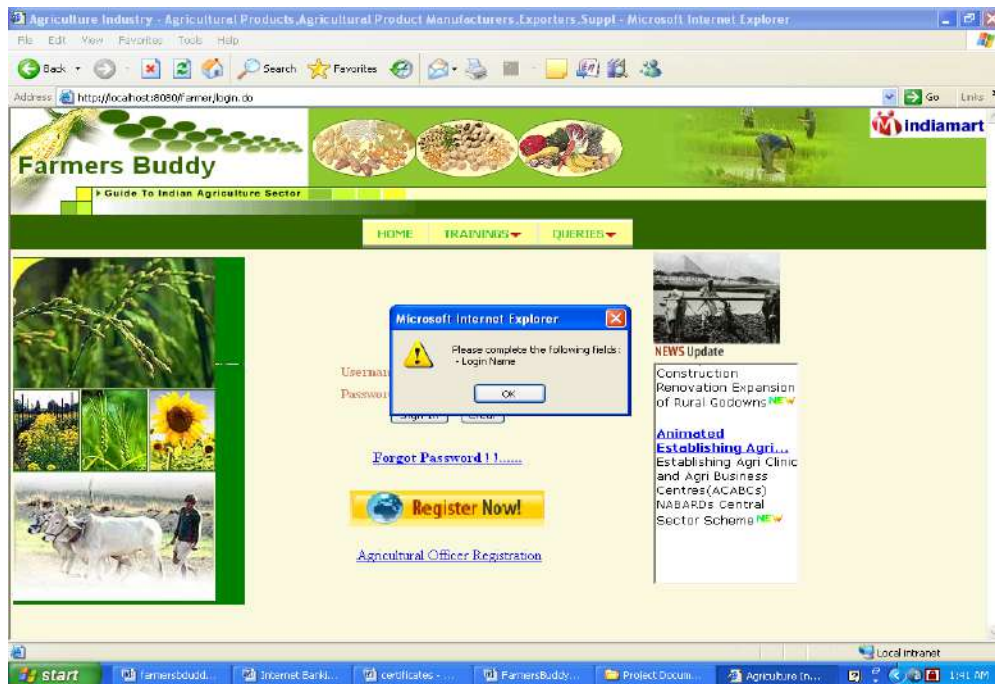
6.Mails:

This module provides the mail system to every user in the system who are authenticated.

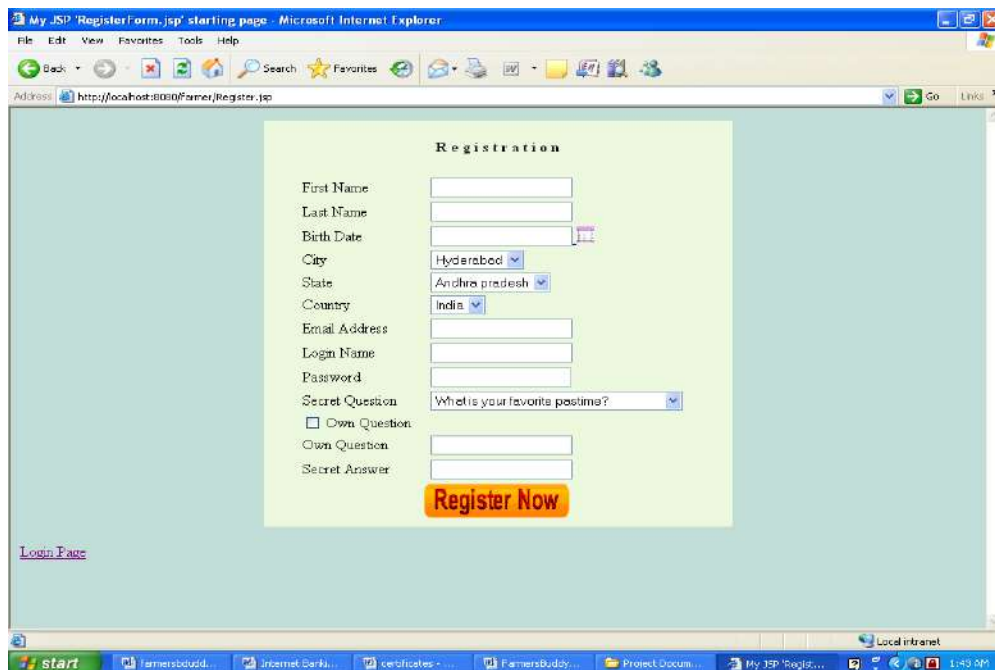
- He can view the inbox to know about the emails he got.
- He can view the sent mails to know the mails he sent.
- He can send the mail to another user.

6.4 Screens

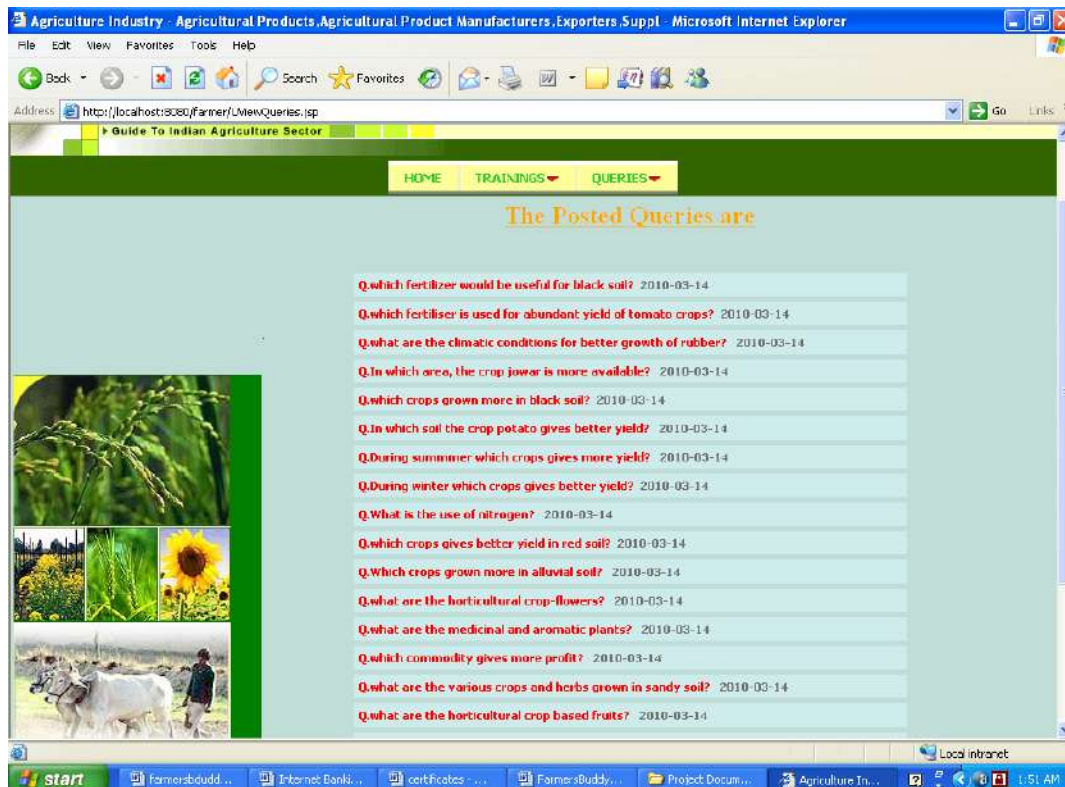
Step1: Login page validation:



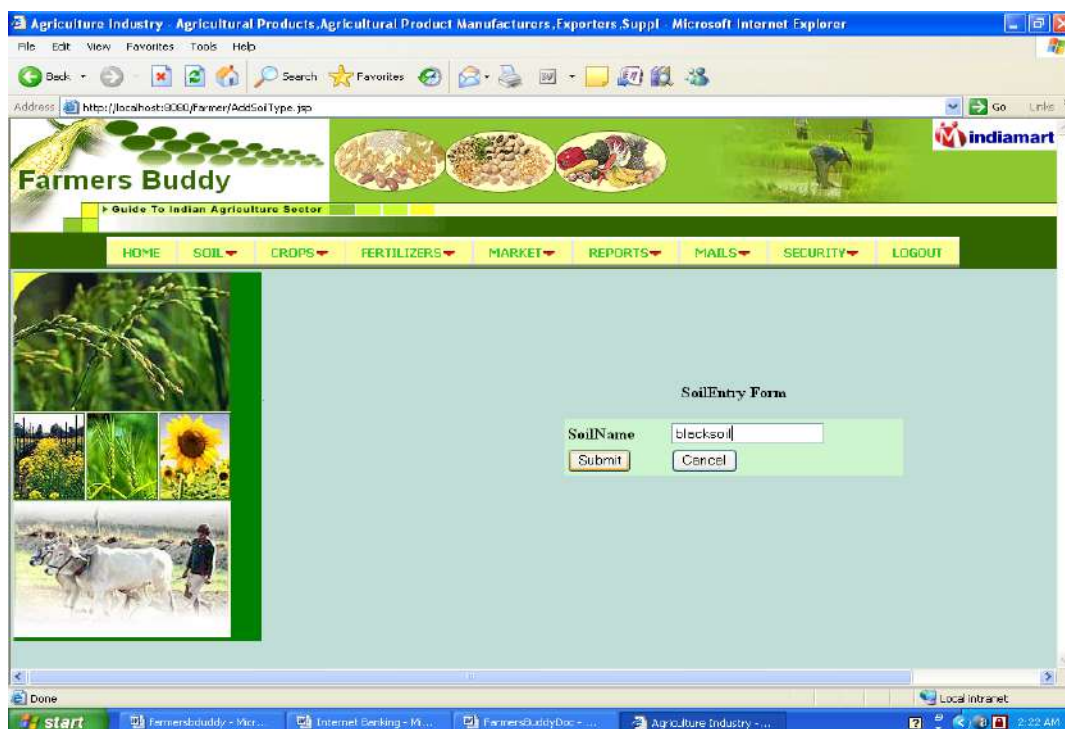
Step 2: Registration page:



Step 3: Queries:



Step 4: Soil Entry Form:



Step 5: District Information:

Agriculture Industry - Agricultural Products, Agricultural Product Manufacturers, Exporters, Suppl - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Search Favorites Go Links

Address http://localhost:8080/farmer/AddDistrict.jsp

Farmers Buddy

Guide To Indian Agriculture Sector

HOME SOIL CROPS FERTILIZERS MARKET REPORTS MAILLS SECURITY LOGOUT

Add District

State: Andhra Pradesh

District:

SoilType:

☐ Black Soil ☐ Red Soil

☐ Alluvial Soil ☐ Laterite Soil

☐ Mountain Soil ☐ Desert Soil

Submit

Done Local intranet

start Farmersbuddy... Internet Banki... certificates -... FarmersBuddy... Project Docum... Agriculture In... 1:55 AM

Step 6: Add Fertilizer Information:

Agriculture Industry - Agricultural Products, Agricultural Product Manufacturers, Exporters, Suppl - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Search Favorites Go Links

Address http://localhost:8080/farmer/Fert.jsp

Farmers Buddy

Guide To Indian Agriculture Sector

HOME SOIL CROPS FERTILIZERS MARKET REPORTS MAILLS SECURITY LOGOUT

ADD FERTILIZER INFORMATION

Soil Name	coastal soil
Type	Crop
CropName	maize
Nitrogen(N)	3.4
Phosphorous(P2O5)	5.7
Coffee Creamer(K2O)	6.78
Use Fertilizer for Hectar	2
Cost of Fertilizer	456.67
Use Fertilizer for Year	667.89
Use Fertilizer for State	2
Use Fertilizer for Crops	4
send clear	

Local intranet

start Farmersbuddy - Mic... Internet Banki - M... FarmersBuddyDoc - ... Agriculture Industry - ... 2:24 AM

Step 7: Add market names:

Agriculture Industry - Agricultural Products, Agricultural Product Manufacturers, Exporters, Suppl - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Search Favorites

Address: http://localhost:8080/farmer/AddMarketDetails.jsp?state_id=1

Farmers Buddy

Guide To Indian Agriculture Sector

HOME SOIL CROPS FERTILIZERS MARKET REPORTS MAILS SECURITY LOGOUT

State: -SELECT-

District: chittoor

Market Area: tirupathi

Add

Done

Local intranet

start Farmersbuddy - Mic... Internet Banking - M... FarmersBuddyDoc - ... Agriculture Industry - ... 2:25 AM

Step 8: Sent mails:

Agriculture Industry - Agricultural Products, Agricultural Product Manufacturers, Exporters, Suppl - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Search Favorites

Address: http://localhost:8081/times/ViewOutbox.jsp?role=admin

Farmers Buddy

Guide To Indian Agriculture Sector

HOME SOIL CROPS FERTILIZERS MARKET REPORTS MAILS SECURITY LOGOUT

Sent Items

<input type="checkbox"/>	To	Subject	Send Date
<input type="checkbox"/>	user@gmail.com	Crop Information	05-SEP-2009
<input type="checkbox"/>	user@gmail.com	hi	26-AUG-2009
<input type="checkbox"/>	user@gmail.com	hi	26-AUG-2009

Delete Clear

Local intranet

6.5 Source code

JSP:

LoginForm.jsp

```
<% @ page language="java" import="java.util.*" pageEncoding="ISO-8859-1"%>

<%String path = request.getContextPath();

String                                     basePath
request.getScheme()+"://"+request.getServerName()+":"+request.getServerPort()+path+"/";

%>
```

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN">

<html>

<head>

    <base href="<%=basePath%>">

    <title>My JSP 'LoginForm.jsp' starting page</title>

    <meta http-equiv="pragma" content="no-cache">

    <meta http-equiv="cache-control" content="no-cache">

    <meta http-equiv="expires" content="0">

    <meta http-equiv="keywords" content="keyword1,keyword2,keyword3">

    <meta http-equiv="description" content="This is my page">

    <!--

    <link rel="stylesheet" type="text/css" href="styles.css">

    -->

</head>

<body>

    <form action="login.do" method="post" name="register">

        <table width="200" border="0" align="center">

            <tr>

                <td><div align="center" class="style25">

                    <% if(request.getParameter("status")!=null)
                    { %><strong><%=request.getParameter("status")%></strong>
```

```

        <% } %>

        </div></td>

</tr>

<tr>

        <td><table        width="314"        height="206"        border="0"        align="center"
bordercolor="#CD817E" bgcolor="#FAF9DE">

                <tr>

                        <td width="1" height="57" valign="top"></td>

                        <td width="280"><div align="center" class="style24">L o g i n</div></td>

                        <td width="29"></td>

                </tr>

                <tr>

                        <td height="120" align="right"></td>

                        <td><table width="226" border="0" align="center">

                                <tr>

                                        <td width="79"><span class="style23">Username</span></td>

                                        <td width="189"><input type="text" name="username">

                                </td>

                                </tr>

                                <tr>

                                        <td><span class="style23">Password</span></td>

                                        <td><label>

                                                <input type="password" name="password">

                                        </label></td>

                                </tr>

                                <tr>

                                        <td colspan="2"><label>

                                                <div align="center">

                                                        <input type="submit" name="Submit" value="Sign In">

                                                        &nbsp;

                                                        <input name="Input2" type="reset" value="Clear">

                                                </div>

```

```

        </label></td>

        </tr>

    </table></td>

    <td>&nbsp;</td>

</tr>

<tr>

    <td height="21">&nbsp;</td>

    <td valign="baseline">

        <div align="center"><span class="style26"><a href="RecoverPassword.jsp">Forgot
Password ! !.....</a></span> <br>

        </div></td>

        <td>&nbsp;</td>

    </tr>

</table></td>

</tr>

</table>

<p align="center"><a href="Register.jsp"></a>&nbsp;</p>

</form>

</body>

</html>

```

Register.jsp:

```

<% @ page language="java" import="java.util.*" pageEncoding="ISO-8859-1"%>

<%

String path = request.getContextPath();

String                                     basePath                                     =
request.getScheme()+"://"+request.getServerName()+":"+request.getServerPort()+path+"/";

%>

<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN">

<html>

```

```

<head>

<base href="<%=basePath%>">

<title>My JSP 'RegisterForm.jsp' starting page</title>

    <meta http-equiv="pragma" content="no-cache">

    <meta http-equiv="cache-control" content="no-cache">

    <meta http-equiv="expires" content="0">

    <meta http-equiv="keywords" content="keyword1,keyword2,keyword3">

    <meta http-equiv="description" content="This is my page">

    <!--

    <link rel="stylesheet" type="text/css" href="styles.css">

    -->

        <script type="text/javascript" src="scripts/ts_picker.js"></script>

<script language="javascript">
function check()
{
    if(!document.register.ch.checked)
    {
        document.register.ownquest.disabled=true;
        document.register.squest.disabled=false;
    }
    else
    {
        document.register.ownquest.disabled=false;
        document.register.squest.disabled=true;
    }
}
</script>
</head>

<body bgcolor="#c1DDD7">

<form name="register" action="register.do" method="post">

<%if(request.getParameter("status")!=null)

```



```

    { %>

    <%=request.getParameter("status")%>

    <% } %>

<table width="481" border="0" align="center" bordercolor="#CD848F" bgcolor="#EDF9DF">

    <tr>

        <td width="7" height="57" valign="top">&nbsp;</td>

        <td width="471"><div align="center"><span class="style11"><strong>R e g i s t r a
t i o n</strong></span></div></td>

        <td width="10">&nbsp;</td>

    </tr>

    <tr>

        <td align="right">&nbsp;</td>

        <td><table width="407" border="0" align="center">

            <tr>

                <td width="128"><span class="style17">First Name </span></td>

                <td width="269"><label>

                    <input type="text" name="firstname">

                    </label></td>

            </tr>

            <tr>

                <td><span class="style17">Last Name </span></td>

                <td><label>

                    <input type="text" name="lastname">

                    </label></td>

            </tr>

            <tr>

                <td><span class="style17">Birth Date </span></td>

                <td><label>

                    <input type="text" name="bdate">

                    <a href="javascript:show_calendar('document.register.bdate', document.register.bdate.value);">

                    </a>

                    </label></td>

```

```

</tr>

<tr>

<td><span class="style17">City</span></td>

<td><label>

<select name="city">

<option>Hyderabad</option>

<option>Mumbai</option>

</select>

</label></td>

</tr>

<tr>

<td><span class="style17">State</span></td>

<td><label>

<select name="state">

<option>Andhra pradesh</option>

<option>Maharashtra</option>

</select>

</label></td>

</tr>

<tr>

<td><span class="style17">Country</span></td>

<td><label>

<select name="country">

<option>India</option>

</select>

</label></td>

</tr>

<tr>

<td><span class="style17">Email Address</span></td>

<td><label>

<input type="text" name="email">

```

```

</label></td>

</tr>

<tr>

<td><span class="style17">Login Name </span></td>

<td><label>

<input type="text" name="loginname">

</label></td>

</tr>

<tr>

<td><span class="style17">Password</span></td>

<td><label>

<input name="password" type="password" id="password">

</label></td>

</tr>

<tr>

<td><span class="style17">

<label>Secret Question</label>

</span></td>

<td><select name="squest">

<option value="1">What is your favorite pastime?</option>

<option value="2">Who was your childhood hero?</option>

<option value="3">What was the name of your first school?</option>

<option value="4">Where did you meet your spouse?</option>

<option value="5">What is your favorite sports team?</option>

<option value="6">What is your father's middle name?</option>

<option value="7">What was your high school mascot?</option>

<option value="8">What make was your first car or bike?</option>

<option value="9">What is your pet's name?</option>

</select></td>

</tr>

<tr>

```

```

<td colspan="2"><span class="style17"> </span><span class="style18">
<label>
<input type="checkbox" name="ch" value="1" onClick="check()">
<span class="style20">Own Question</span> </label>
</span><span class="style17"> </span></td>
</tr>
<tr>
<td><span class="style17">Own Question </span></td>
<td><label>
<input type="text" name="ownquest" disabled>
</label></td>
</tr>
<tr>
<td><span class="style17">Secret Answer </span></td>
<td><input name="sanswer" type="text"></td>
</tr>
<tr>
<td colspan="2"><input type="hidden" name="diff" value="user">
</td>
<td colspan="2"><div align="center">
<INPUT type="image" name="submit" src="./images/RegisterNow.gif"
border="0" style="border-width: 1px; height:40px; width:150px;" type="image">
</div></td>
</tr>
</table>
</td>
</tr>
</table>
</form>
</body>
</html>

```

6.6 System Evolution

Our system should provide services to the users who are existing in this system. Users should have valid user id and password to enter the system. The administrator, agricultural students, general public, agricultural officer can use the benefits of the system who are having valid user id and password.

System to be changed:

In the existing system periodic generation of reports takes lot of time. It is time consuming and lot of complications will arise. So there is necessity to change the system and then the time taking will be very short.

System understanding:

Complete understanding of the system that is to be done i.e. brief study of the requirements and designing of the system is to be developed.

System validation:

Validation can be find in many ways, but a simple definition is that validation succeeds when software functions in a manner that can be reasonably expected by the user, i.e. fulfilling all the user specified requirements.

Modified system:

Modified system provides periodic generation of reports which is not available for the existing system such that reduce work being done manually and time consumption.

7. Testing

7.1 Functional test cases:

Test case ID	Description	Test steps	Expected value	Actual value	OK/Error
1.	Verify login page	Input username and password	Login page	Invalid data	error
2	Verify login page	Input username and password	Login page	Login page	ok
3.	Verify registration page	Registration	User profile	Registration failed	error
4.	Verify registration page	Registration	User profile	User profile	ok
5.	Query is to be posted	Posting query	Query is posted	Unable to post the query	error
6.	Query is to be posted	Posting query	Query is posted	Successfully posted	ok
7.	Soil name is to be entered	Enter soil name	Soil name is entered	Soil is entered	ok
8.	Crop name is to be entered	Enter crop name	Crop name is entered	Crop name is entered	ok
9.	Fertilizer information is to be entered	Enter fertilizer information	Fertilizer information is entered	Fertilizer information is entered	ok
10.	Commodity is to be entered	Enter commodity	Commodity is entered	Commodity is entered	ok
11.	Market details to be entered	Enter market details	Details of market is entered	Details of market is entered	ok

12.	Training information is to be entered	Enter training information	Information of training is entered	Information of training is entered	ok
-----	---------------------------------------	----------------------------	------------------------------------	------------------------------------	----

7.2 Integration test cases:

Test case ID	Description	Test steps	Expected value	Actual value	OK/Erro r
1.	Verify that user should has correct user id and password to enter the system	<p>1. Invoke the browser</p> <p>2. Entering the User ID and Password in login page</p> <p>3. Click on trainings after entering the home page</p> <p>4. Click on queries</p>	<p>1. page should be displayed with following fields:</p> <p>a)username</p> <p>b)password</p> <p>c)sign in link</p> <p>d)forgot password link</p> <p>e) register now link</p> <p>2. Home page of the user will be displayed</p> <p>3. Add trainings and view trainings will be displayed</p>	<p>1. Page should be displayed with following fields:</p> <p>a)username</p> <p>b)password</p> <p>c)sign in link</p> <p>d)forgot password link</p> <p>e) register now link</p> <p>2. Home page of the user will be displayed</p> <p>3. Add trainings and view trainings will be displayed</p>	

		<p>5. click on soil</p> <p>6. click on crops.</p> <p>7. click on fertilizers</p> <p>8. click on market details</p> <p>9. click on mails</p>	<p>4. View queries and post queries will be displayed</p> <p>5. Add soil , update soil,state information,district information will be displayed</p> <p>6. Add crop, update crops will be displayed</p> <p>7. Add fertilizers, update fertilizers, view fertilizers will be displayed</p> <p>8. Add markets,view markets,add commodities,view commodities will be displayed</p> <p>9. Inbox,sent mails,search will be displayed</p>	<p>4. View queries and post queries will be displayed</p> <p>5. Add soil , update soil,state information,district information will be displayed</p> <p>6. Add crop, update crops information will be displayed</p> <p>7. Add fertilizers, update fertilizers, view fertilizers will be displayed</p> <p>8. Add markets,view markets,add commodities,view commodities will be displayed</p> <p>9. Inbox,sent mails,search will be displayed</p>	OK
--	--	---	--	--	----

7.3 System test cases:

Test case ID	Description	Test steps	Expected value	Actual value	OK/Error
1.	Verify that admin user should be able to generate the given functions.	<p>1. Invoke the browser</p> <p>2. Entering the User ID and Password in login page</p> <p>3. Click on trainings after entering the home page</p> <p>4. Click on queries</p> <p>5. click on soil</p>	<p>1. page should be displayed with following fields:</p> <p>a)username</p> <p>b)password</p> <p>c)sign in link</p> <p>d)forgot password link</p> <p>e) register now link</p> <p>2. Home page of the user will be displayed</p> <p>3. Add trainings and view trainings will be displayed</p> <p>4. View queries and post queries will be displayed</p> <p>5. Add soil , update soil,state</p>	<p>1. Page should be displayed with following fields:</p> <p>a)username</p> <p>b)password</p> <p>c)sign in link</p> <p>d)forgot password link</p> <p>e) register now link</p> <p>2. Home page of the user will be displayed</p> <p>3. Add trainings and view trainings will be displayed</p> <p>4. View queries and post queries will be displayed</p> <p>5. Add soil , update soil,state information,distric</p>	

			information,district information will be displayed	t information will be displayed	
		6. click on crops.	6. Add crop, update crops will be displayed	6. Add crop, update crops information will be displayed	
		7. click on fertilizers	7. Add fertilizers, update fertilizers, view fertilizers will be displayed	7. Add fertilizers, update fertilizers, view fertilizers will be displayed	
		8. click on market details	8. Add markets,view markets,add commodities,view commodities will be displayed	8. Add markets,view markets,add commodities,view commodities will be displayed	
		9. click on mails	9. Inbox,sent mails,search will be displayed	9. Inbox,sent mails,search will be displayed	OK

8.Conclusion

By this project, we provide various information required for farmers and agricultural students and also providing solutions to them about queries posted by them. This makes agriculture more ecofriendly and this portal is very useful to farmers and agricultural students.

9. Appendix A - Hardware and Software Configurations

HARDWARE REQUIREMENTS:

Processor	: Pentium IV
Hard Disk	: 40GB
RAM	: 512MB or more

SOFTWARE REQUIREMENTS:

Operating System	: Windows XP/2003 or Linux
User Interface	: HTML, CSS
Client-side Scripting	: JavaScript
Programming Language	: Java
Web Applications	: JDBC, Servlets, JSP
Database	: Oracle 10g
Server Deployment	: Tomcat 5.0

10. Appendix B – Data Base Tables

Loginprofile:

Name	Constraint	Datatype
Loginid	Primary key	Varchar2(40)
birthdate		Date
City		Varchar2(40)
State		Varchar2(40)
Country		Varchar2(40)
Profilemodification		Date
email		Varchar2(25)
qualification		Varchar2(30)
designation		Varchar2(30)

LoginDetails:

Name	Constraint	Datatype
Loginname	Primary key	Varchar2(30)
Password		Varchar2(30)
Logintype		Varchar2(20)
First_name		Varchar2(40)
Last_name		Varchar2(40)
Login_status		number
Reg_date		Date

Squestionid	Primary key	number
sanswer		Varchar2(40)
Passmodified		Date
firstlogin		number

Commodity:

Name	Constraint	Datatype
Cmid	Primary key	number
cname		Varchar2(35)

Fert_info:

Name	Constraint	Datatype
Soil_id		number
Nitrogen		number
Phosphor		number
Coffeecreamer		number
Usefertacre		number
Costfert		number
Usefertyear		number
Usefertstate		number
Cvherb1		Varchar2(20)
Cropsname		Varchar2(30)
Soil_name		Varchar2(20)

Login_audit:

Name	Constraint	Datatype
Loginid	Foreign key	Varchar2(40)
Logindate		Date
Login_desc		Varchar2(40)

Mails:

Name	Constraint	Datatype
Messageid		number
Fromname		Varchar2(20)
Toname		Varchar2(20)
senddate		date
subject		Varchar2(30)
message		Varchar2(100)
Senderstatus		Number
receiverstatus		number

Market_details:

Name	Constraint	Datatype
State_code	Foreign key	number
Dist_code	Foreign key	number

Marketid	Foreign key	number
market		Varchar2(30)

Market_report:

Name	Constraint	Datatype
Market	Primary key	number
Arrivals		number
Arrival_dt		date
Unit of arrival		Varchar2(20)
Variety	Foreign key	number
grade		Varchar2(20)
Minprice		number
Maxprice		number
Modalprice		number
Unitprice		Varchar2(30)
Id		number

Query:

Name	Constraint	Datatype
Queryid		number
Query		Varchar2(150)
Postedby		Varchar2(20)

Pstdate		date
answer		Varchar2(200)
ansby	Primary key	Varchar2(30)
Status		Varchar2(10)

Question_base:

Name	Constraint	Datatype
Question_id	Foreign key	number
Question_description		Varchar2(70)

Sb_crops:

Name	Constraint	Datatype
Soil_code	Foreign key	number
Soil_name		Varchar2(40)
Cropname		Varchar2(20)
Season		Varchar2(20)
cvherb		Varchar2(20)

Soil_ident:

Name	Constraint	Datatype
Soil_code	Primary key	number
Soil_name		Varchar2(40)

Soil_type:

Name	Constraint	Datatype
State_code	Foreign key	number
Soil_code	Foreign key	Varchar2(40)
Dist_code	Primary key	number
Dist_name		Varchar2(40)

State_info:

Name	Constraint	Datatype
State_code	Primary key	number
State		Varchar2(40)
Wcondition		Varchar2(200)

Traing_info:

Name	Constraint	Datatype
Traing_id		number
Title	Foreign key	Varchar2(40)
Description		Varchar2(200)
Schedule		Varchar2(20)
status		Varchar2(20)

Training_request:

Name	Constraint	Datatype
Req_id		number
Name		Varchar2(20)
Role		Varchar2(20)
Place		Varchar2(20)
title	Primary key	Varchar2(20)
description		Varchar2(20)
Reqschedule		Varchar2(20)

11. Appendix C- Limitations And Enhancements

Limitations:

- It is open discussion forum so that everyone uploads unwanted and wrong information so that it misleads the students and farmers.
- Quite inefficiency in querying details.

Enhancements:

It is not possible to develop a system that makes all the requirements of the user. User requirements keep changing as the system is being used. Some of the future enhancements that can be done to this system are:

- As the technology emerges, it is possible to upgrade the system and can be adaptable to desired environment.
- Because it is based on object-oriented design, any further changes can be easily adaptable.
- Based on the future security issues, security can be improved using emerging technologies.
- Case Registration module can be added

12. Appendix D-Bibliography:

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- (3) Java and XML By Brett McLaughlin
- (4) Wikipedia, URL: <http://www.wikipedia.org>.
- (5) Answers.com, Online Dictionary, Encyclopedia and much more, URL: <http://www.answers.com>
- (6) Project Management URL: <http://www.startwright.com/project.htm>

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5	200151159	D.Vijay Kumar	MPCs	Language Question Paper App
6	200151217	J.Manjunath Swamy	MECs	Language Question Paper App
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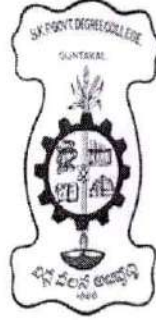
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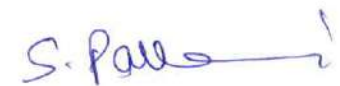


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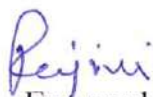

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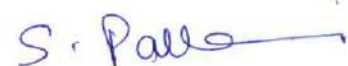


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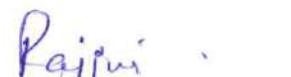
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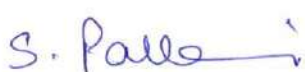


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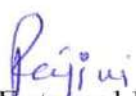
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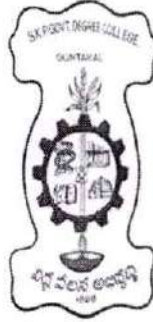

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S K P GOVERNMENT DEGREE COLLEGE GUNTAKAL

Ananthapuramu District.

DEPARTMENT OF COMPUTER SCIENCE

PROJECT WORK 2021-22



CERTIFICATE

This is to certify that the Project **“Farmers Information System”** is a bonafide work of **K.Sudhakar** submitted to faculty of Computer Science Department in Partially fulfillment of the requirements for the award of Degree of Bachelor of Science in Computer Science from SKP Govt. Degree College, Guntakal.


Project Guide

C M Kishore Kumar M.Sc.,M.Phil


Head of the Department

S Pavani M.Sc.,B.Ed,


External Examiner



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GUNTAKAL, Ananthapuramu (Dt.)

S.K.P.GOV.T.DEGREE COLLEGE, GUNTAKAL

PROJECT REPORTS-

Academic Year -2021-2022

S.No	Hall ticket Number	Name of the Student	Group/Class	Title of the Project
1	200151211	G. Vaishnavi	MECs	E-Health Care Management System
2	200151146	M.Hemanth Kalyan	MPCs	E-Health Care Management System
3	200151222	M.Prudhvi Sai	MECs	E-Health Care Management System
4	200151229	S.Mahaboob	MECs	E-Health Care Management System
5	200151173	T.Pavan Kalyan	MPCs	E-Health Care Management System
6	200151149	S.M.D.Fayaz	MPCs	E-Health Care Management System


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DEPARTMENT OF COMPUTER SCIENCE

PROJECT WORK 2021-22



CERTIFICATE

This is to certify that the Project **“E-Healthcare Management System”** is a bonafide work of **G. Vaishnavi** submitted to faculty of Computer Science Department in Partially fulfillment of the requirements for the award of Degree of Bachelor of Science in Computer Science from SKP Govt. Degree College, Guntakal.

D.C. Sowjanya
Project Guide

D C Sowjanaya MCA

S. Pavani
Head of the Department

S Pavani M.Sc., B.Ed.

Rajini
External Examiner

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S K P GOVERNMENT DEGREE COLLEGE GUNTAKAL

Ananthapuramu District.

DEPARTMENT OF COMPUTER SCIENCE

PROJECT WORK 2021-22



CERTIFICATE

This is to certify that the Project **“E-Healthcare Management System”** is a bonafide work of **M.Hemanth Kalyan** submitted to faculty of Computer Science Department in Partially fulfillment of the requirements for the award of Degree of Bachelor of Science in Computer Science from SKP Govt. Degree College, Guntakal.

D.C. Sowjanya
Project Guide

D C Sowjanaya MCA

S. Pavani
Head of the Department

S Pavani M.Sc., B.Ed,

Pajjuri
External Examiner

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Ananthapuramu District.

DEPARTMENT OF COMPUTER SCIENCE

PROJECT WORK 2021-22



CERTIFICATE

This is to certify that the Project “**E-Healthcare Management System**” is a bonafide work of **M.Prudhvi Sai** submitted to faculty of Computer Science Department in Partially fulfillment of the requirements for the award of Degree of Bachelor of Science in Computer Science from SKP Govt. Degree College, Guntakal.

D.C. Sowjanya
Project Guide

D C Sowjanaya MCA

S. Pavani
Head of the Department

S Pavani M.Sc.,B.Ed,

P. Raju
External Examiner

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S K P GOVERNMENT DEGREE COLLEGE GUNTAKAL

Ananthapuramu District.

DEPARTMENT OF COMPUTER SCIENCE

PROJECT WORK 2021-22



CERTIFICATE

This is to certify that the Project **“E-Healthcare Management System”** is a bonafide work of S.Mahaboob submitted to faculty of Computer Science Department in Partially fulfillment of the requirements for the award of Degree of Bachelor of Science in Computer Science from SKP Govt. Degree College, Guntakal.

D.C. Sowjanaya
Project Guide

D C Sowjanaya MCA

S. Pavani
Head of the Department

S Pavani M.Sc., B.Ed,

Pajjuri
External Examiner

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S.K.P. Govt. Degree College
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S K P GOVERNMENT DEGREE COLLEGE GUNTAKAL

Ananthapuramu District.

DEPARTMENT OF COMPUTER SCIENCE

PROJECT WORK 2021-22



CERTIFICATE

This is to certify that the Project “**E-Healthcare Management System**” is a bonafide work of **T.Pavan Kalyan** submitted to faculty of Computer Science Department in Partially fulfillment of the requirements for the award of Degree of Bachelor of Science in Computer Science from SKP Govt. Degree College, Guntakal.

D.C. Sowjanya
Project Guide

D C Sowjanaya MCA

S. Pavani

Head of the Department

S Pavani M.Sc., B.Ed,

P. Rajini
External Examiner

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Ananthapuramu District.

DEPARTMENT OF COMPUTER SCIENCE

PROJECT WORK 2021-22



CERTIFICATE

This is to certify that the Project **“E-Healthcare Management System”** is a bonafide work of **S.M.D.Fayaz** submitted to faculty of Computer Science Department in Partially fulfillment of the requirements for the award of Degree of Bachelor of Science in Computer Science from SKP Govt. Degree College, Guntakal.

D.C. Sowjanya
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D C Sowjanaya MCA

S. Pavani
Head of the Department

S Pavani M.Sc., B.Ed,

Pavani
External Examiner

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S.K.P.GOV.T.DEGREE COLLEGE, GUNTAKAL

PROJECT REPORTS

Academic Year -2021-2022

S.No	Hall ticket Number	Name of the Student	Group/Class	Title of the Project
1	200151148	S.Waheeda Begum	MPCs	Image classification based on Numbers Identification by Deep Learning Models
2	200151166	N.Durga Naik	MPCs	Image classification based on Numbers Identification by Deep Learning Models
3	200151150	A.Narendra	MPCs	Image classification based on Numbers Identification by Deep Learning Models
4	200151214	G.Ramesh	MECs	Image classification based on Numbers Identification by Deep Learning Models
5	200151216	J.Ranga Reddy	MECs	Image classification based on Numbers Identification by Deep Learning Models
6	200151141	B.Soyab Akthar	MPCs	Image classification based on Numbers Identification by Deep Learning Models

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DEPARTMENT OF COMPUTER SCIENCE

PROJECT WORK 2021-22




CERTIFICATE

This is to certify that the Project “**Image classification based on Numbers Identification by Deep Learning Models**” is a bonafide work of **S.Waheeda Begum** submitted to faculty of Computer Science Department in Partially fulfillment of the requirements for the award of Degree of Bachelor of Science in Computer Science from SKP Govt. Degree College, Guntakal.


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D Siva Sankar M.Tech


Head of the Department

S Pavani M.Sc.,B.Ed,


External Examiner


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PROJECT WORK 2021-22



CERTIFICATE

This is to certify that the Project “**Image classification based on Numbers Identification by Deep Learning Models**” is a bonafide work of **N.Durga Naik** submitted to faculty of Computer Science Department in Partially fulfillment of the requirements for the award of Degree of Bachelor of Science in Computer Science from SKP Govt. Degree College, Guntakal.



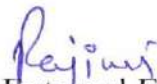
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D Siva Sankar M.Tech



Head of the Department

S Pavani M.Sc.,B.Ed,



External Examiner



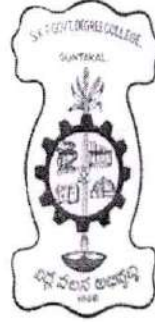
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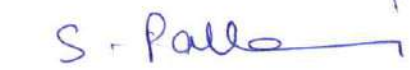


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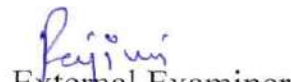
This is to certify that the Project “**Image classification based on Numbers Identification by Deep Learning Models**” is a bonafide work of **A.Narendra** submitted to faculty of Computer Science Department in Partially fulfillment of the requirements for the award of Degree of Bachelor of Science in Computer Science from SKP Govt. Degree College, Guntakal.


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D Siva Sankar M.Tech


Head of the Department

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External Examiner

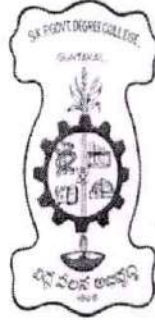

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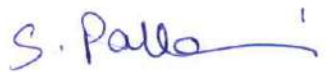


CERTIFICATE

This is to certify that the Project “Image classification based on Numbers Identification by Deep Learning Models” is a bonafide work of G.Ramesh submitted to faculty of Computer Science Department in Partially fulfillment of the requirements for the award of Degree of Bachelor of Science in Computer Science from SKP Govt. Degree College, Guntakal.


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D Siva Sankar M.Tech


Head of the Department

S Pavani M.Sc.,B.Ed,


External Examiner


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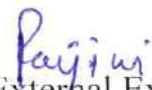
This is to certify that the Project **“Image classification based on Numbers Identification by Deep Learning Models”** is a bonafide work of **J.Ranga Reddy** submitted to faculty of Computer Science Department in Partially fulfillment of the requirements for the award of Degree of Bachelor of Science in Computer Science from SKP Govt. Degree College, Guntakal.


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D Siva Sankar M.Tech


Head of the Department

S Pavani M.Sc.,B.Ed,


External Examiner


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Ananthapuramu District.

DEPARTMENT OF COMPUTER SCIENCE

PROJECT WORK 2021-22



CERTIFICATE

This is to certify that the Project **“Image classification based on Numbers Identification by Deep Learning Models”** is a bonafide work of **B.Soyab Akthar** submitted to faculty of Computer Science Department in Partially fulfillment of the requirements for the award of Degree of Bachelor of Science in Computer Science from SKP Govt. Degree College, Guntakal.

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D Siva Sankar M.Tech

Head of the Department

S Pavani M.Sc.,B.Ed,

External Examiner

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S.K.P.GOV.T.DEGREE COLLEGE, GUNTAKAL

PROJECT REPORTS

Academic Year -2021-2022

S.No	Hall ticket Number	Name of the Student	Group/Class	Title of the Project
1	200151174	T.M.Jyothi	MPCs	Computer Question Paper App
2	200151208	C.Seena	MECs	Computer Question Paper App
3	200151147	S.Roshan Shameer	MPCs	Computer Question Paper App
4	200151213	G.Naveen Kumar	MECs	Computer Question Paper App
5	200151152	B.Veeranjineyulu	MPCs	Computer Question Paper App
6	200151163	K.Rajasekhar	MPCs	Computer Question Paper App
6	200151157	C.Rajesh	MPCs	Computer Question Paper App

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Ananthapuramu District.

DEPARTMENT OF COMPUTER SCIENCE

PROJECT WORK 2021-22



CERTIFICATE

This is to certify that the Project “**Computer Question Paper App**” is a bonafide work of T.M.Jyothi submitted to faculty of Computer Science Department in Partially fulfillment of the requirements for the award of Degree of Bachelor of Science in Computer Science from SKP Govt. Degree College, Guntakal.

D.C. Sowjanya
Project Guide

D C Sowjanaya MCA

S. Palla
Head of the Department

S Pavani M.Sc.,B.Ed,

Rajini
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DEPARTMENT OF COMPUTER SCIENCE

PROJECT WORK 2021-22



CERTIFICATE

This is to certify that the Project **“Computer Question Paper App”** is a bonafide work of C.Seena submitted to faculty of Computer Science Department in Partially fulfillment of the requirements for the award of Degree of Bachelor of Science in Computer Science from SKP Govt. Degree College, Guntakal.

D.C. Sowjanya
Project Guide

D C Sowjanaya MCA

S. Pavani

Head of the Department

S Pavani M.Sc.,B.Ed,

Rajini
External Examiner

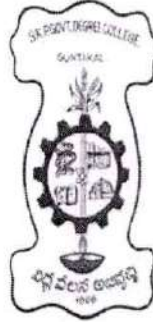
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Ananthapuramu District.

DEPARTMENT OF COMPUTER SCIENCE

PROJECT WORK 2021-22



CERTIFICATE

This is to certify that the Project “**Computer Question Paper App**” is a bonafide work of **S.Roshan Shameer** submitted to faculty of Computer Science Department in Partially fulfillment of the requirements for the award of Degree of Bachelor of Science in Computer Science from SKP Govt. Degree College, Guntakal.

D.C. Sowjanya
Project Guide

D C Sowjanaya MCA

S. Pavani
Head of the Department

S Pavani M.Sc.,B.Ed.

Rajini
External Examiner

PRINCIPAL
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GUNTAKAL, Ananthapuramu (A.P.)

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Ananthapuramu District.

DEPARTMENT OF COMPUTER SCIENCE

PROJECT WORK 2021-22



CERTIFICATE

This is to certify that the Project **“Computer Question Paper App”** is a bonafide work of **G.Naveen Kumar** submitted to faculty of Computer Science Department in Partially fulfillment of the requirements for the award of Degree of Bachelor of Science in Computer Science from SKP Govt. Degree College, Guntakal.

D.C. Sowjanya
Project Guide

D C Sowjanaya MCA

S. Pallavi
Head of the Department

S Pavani M.Sc.,B.Ed,

Rejini
External Examiner

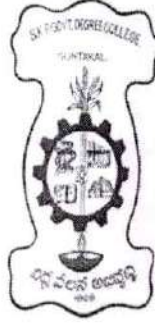
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Ananthapuramu District.

DEPARTMENT OF COMPUTER SCIENCE

PROJECT WORK 2021-22



CERTIFICATE

This is to certify that the Project **“Computer Question Paper App”** is a bonafide work of **B.Veeranjinevulu** submitted to faculty of Computer Science Department in Partially fulfillment of the requirements for the award of Degree of Bachelor of Science in Computer Science from SKP Govt. Degree College, Guntakal.

D.C. Sowjanya
Project Guide

D C Sowjanaya MCA

S. Pallu
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Rajini
External Examiner

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Ananthapuramu District.

DEPARTMENT OF COMPUTER SCIENCE

PROJECT WORK 2021-22



CERTIFICATE

This is to certify that the Project “**Computer Question Paper App**” is a bonafide work of **K.Rajasekhar** submitted to faculty of Computer Science Department in Partially fulfillment of the requirements for the award of Degree of Bachelor of Science in Computer Science from SKP Govt. Degree College, Guntakal.

D.C. Sowjanya
Project Guide

D C Sowjanaya MCA

S. Pavani

Head of the Department

S Pavani M.Sc.,B.Ed,

Rajini
External Examiner

PRINCIPAL
S.K.P. Govt. Degree College
GUNTAKAL, Ananthapuramu (D.)

S K P GOVERNMENT DEGREE COLLEGE GUNTAKAL

Ananthapuramu District.

DEPARTMENT OF COMPUTER SCIENCE

PROJECT WORK 2021-22



CERTIFICATE

This is to certify that the Project **“Computer Question Paper App”** is a bonafide work of C.Rajesh submitted to faculty of Computer Science Department in Partially fulfillment of the requirements for the award of Degree of Bachelor of Science in Computer Science from SKP Govt. Degree College, Guntakal.

D.C. Sowjanya.
Project Guide

D C Sowjanaya MCA

S. Pavani
Head of the Department

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Rajini
External Examiner

PRINCIPAL
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