B.Sc (CHEMISTRY) – I – YEAR

SEM – I

PAPER – I

PRACTICAL QUESTION BANK

- Analyse the given salt mixture systematically by semi micro qualitative technique and identify two anions and two cations present in it.
- The following salt mixture to be given in the practical examination.

1) Aluminium sulphate + Cadmium acetate
2) Strontiom carbonate + Lead chloride
3) Mercuric chloride + Ammonium Carbonate
4) Bismuth nitrate + Ammonium borate
5) Calcium carbonate + Cadmium iodide
6) Barium nitrate + Ammonium chloride
7) Magnesium carbonate + Ammonium bromide
8) Ammonium acetate + Manganese bromide
9) Zinc carbonate + Aluminium sulphate
10) Ammonium phosphate + Cadmium chloride

SCHEME OF EVALUTATION

Students has to identify two anions & two cations

1) Experiment — 20 marks
   - Solubility = 1 mark
   - Flame test = 1 mark
   - 2 anions * 4 = 8 marks
   - 2 cations *4 = 8 marks
   - Result = 2 marks
2) Viva = 2 marks
3) Record= 3 marks

TOTAL = 25 MARKS

# SATAVAHANA UNIVERSITY

## Bsc III year(CBCS) Chemistry-V (Semester-V) Practical Examinations

## ORGANIC SYNTHESIS AND TLC

TIME 2 Hrs | QUTION BANK | Max marks :25

### Section – I

1. Prepare a pure sample of Acetyl Salicylic acid (Asprin) by Acetylation of salicylic acid.
2. Prepare a pure sample of Benzanilide by the Benzoyltion reaction of Aniline.
3. Prepare a pure sample of Nitro benzene from Benzene by aromatic electrophilic substitution reactio
4. Prepare a pure sample of Meta di nitro benzene from nitro benzene by nitration reaction.
5. Prepare a pure sample of p-bromo acetanilide by the electrophilic bromination of Acetanilide.
6. Prepare a pure sample of 2,4,6-tri bromo phenol from phenol.
7. Prepare a pure sample of Benzoic acid from Benzyl chloride by oxidation process.
8. Prepare a pure sample of n- Butyl acetate using n-Butyl alcohol and acetic acid.
9. Prepare a pure sample of B-naphthyl methyl ether by the methylation of B-naphthol.
10. Prepare a pure sample of Benzylidine aniline from Benzaldehyde .
11. Prepare a pure sample of phenyl azo-B-naphthol by diazotisation and coupling method.

### Section – II

1. Separate the mixture of 2,4-di nitro phenyl hydrazones of acetone and 2- butanone by TLC method and Determine the Rf values
2. Separate the mixture of ortho and para nitro aniline by column chromatography.

### Scheme of valuation

I. Principle, Reaction and Mechanism for the preparation = 12
II. Separation of two component mixture and calculation of Rf values = 8
III. Viva = 02
IV. Record = 03

TOTAL = 25 Marks

SATAVAHANA UNIVERSITY

Bsc IIIrd year (CBCS) CHEMISTRY — VIII

SEMISTER — VI Practical Examination

Time 2 hrs Max marks 25

I. a) Determine the hydrolysis of methyl acetate catalysed by Hydro gen ion (Acid) and determine the rate constant graphically .

b) Determine the rate of the decomposition of hydrogen peroxide catalysed by FeCl3 ( Fe+ 3) and determine the rate constant graphically.

II.a) Detemine the redox potential of Fe+2/Fe+3 by potential metric titration using Ferrous Ammonium Sulphate solution .

b) Determine the constration of given Silver nitrate Solution from the potentiometric titration of KCL and AgNO3 .

c) Determine the strenghth of unknown solution of HCL by potenti ometric titration using NaOH solution.

d) Determine the dissociation constant of weak acid with strong base by Ph metric method.

III. Determine the overall order of reaction of Saponification Ethyl Acetate with NaOH by conductance measurements.

SCHEME OF VALUATION

I. Experiment — 20 marks

a) principle — 05

b) Calculation —04

c) tabulation, graph. Units = 10

d) result = 01

II. Viva = 02

III. Record = 03

Total = 25 marks

**Laboratory Course** **45h (3 h / week)**

**Paper I - Qualitative Analysis - Semi micro analysis of mixtures**

Analysis of two anions (one simple, one interfering) and two cations in the given mixture.

Anions: $CO_3^{2-}, SO_3^{2-}, S^{2-},\ Cl^-,\ Br^-, I^-,\ CH_3COO^-, NO_3^-,\ PO_4^{3-}, BO_3^{3-}, SO_4^{2-}$. .

Cations: $Hg_2^{2+}, Ag^+, Pb^{2+}$

$Hg^{2+}, Pb^{2+},\ Bi^{3+}, Cd^{2+}, Cu^{2+},\ As^{3+/5+}, Sb^{3+/5+}, Sn^{2+/4+}$

$Al^{3+},\ Cr^{3+}, Fe^{3+}$

$Zn^{2+}, Ni^{2+}, Co^{2+}, Mn^{2+}$

$Ba^{2+},\ Sr^{2+}, Ca^{2+}$

$Mg^{2+},\ NH_4^+$

**Laboratory Course** **45hrs (3 h / week)**

**Paper II- Quantitative Analysis**

**Acid - Base titrations**

1. Estimation of Carbonate in Washing Soda.
2. Estimation of Bicarbonate in Baking Soda.
3. Estimation of Carbonate and Bicarbonate in the Mixture.



4. Estimation of Alkali content in Antacid using HCl.
5. Estimation of $NH_4^+$ by back titration

**Redox Titrations**

1. Determination of Fe(II) using $K_2Cr_2O_7$
2. Determination of Fe(II) using $KMnO_4$ with sodium oxalate as primary standard.
3. Determination of Cu(II) using $Na_2S_2O_3$ with $K_2Cr_2O_7$ as primary standard



**Complexometric Titrations**

1. Estimation of $Mg^{2+}$
2. Estimation of $Cu^{2+}$

**Laboratory Course**

**Paper III (Organic Synthesis)** **45 h (3h/week)**

1. **Synthesis of Organic compounds:**

   Acetylation: Acetylation of salicylic acid, Benzoylation of Aniline.

   Aromatic electrophilic substitution: Nitration: Preparation of nitro benzene and m-dinitro benzene.

   Halogenation: Preparation of p-bromo acetanilide, Preparation of 2,4,6-tribromo phenol

   Oxidation: Preparation of benzoic acid from benzyl chloride.

   Esterification: Preparation of n-butyl acetate from acetic acid.

   Methylation: Preparation of - naphthyl methyl ether.

   Condensation: Preparation of benzilidine aniline and Benzaldehyde and aniline.

   Diazotisation: Azocoupling of β-Naphthol.

2. **Microwave assisted synthesis of Asprin – DEMO (demonstration only)**

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## Laboratory Course
## Paper IV-
### Qualitative Analysis of Organic Compounds: 45hrs (3 h/week)

Qualitative analysis: Identification of organic compounds through the functional group analysis - ignition test, determination of melting points/boiling points, solubility test, functional group tests and preparation of suitable derivatives of the following: Carboxylic acids, phenols, amines, urea, thiourea, carbohydrates, aldehydes, ketones, amides, nitro hydrocarbons, ester and naphthalene.

## Semester - V
## Laboratory Course
## Paper V Experiments in Physical Chemistry-I

**45 h (3 h / w)**

**1. Distribution law**

a) Determination of molecular status and partition coefficient of benzoic acid in Toluene and water.

b) Determination of distribution coefficient of acetic acid between n-butanol and water.

**2. Electrochemistry**

a) Determination of cell constant of a conductivity cell.

b) Verification of Ostwald's dilution law- Determination of dissociation constant ($K_a$) of acetic acid by conductivity measurements.

**3. Colorimetry**

a) Verification of Beer's law using $KMnO_4$

b) Determination of the concentration of the given $KMnO_4$ solution.

**4. Adsorption**

b) Adsorption of acetic acid on animal charcoal - Verification of Freundlich adsorption isotherm.

**5. Physical constants**

a) Surface tension and b) viscosity of liquids. (Demonstration Experiment)

**Semester - VI**
**Laboratory course**
**Paper VI Experiments in Physical Chemistry-II**

**45h (3 h/w)**

**1. Kinetics**

a) Determination of specific reaction rate of the hydrolysis of methyl acetate catalyzed by hydrogen ion at room temperature.
b) Determination of rate of decomposition of hydrogen peroxide catalyzed by $FeCl_3$ .

**2. Electrochemistry**

**A. Potentiometry**:

a) Determination of redox potential of $Fe^{2+}/Fe^{3+}$ by potentiometric titration of ferrous ammonium sulphate vs. potassium dichromate.
b) Precipitation titration of KCl vs. $AgNO_3$ -Determination of given concentration of silver nitrate.

**B. pH metry:**

a) pH metric titration of strong acid (HCl) vs. strong base- Determination of the concentration of the given acid.
b) pH metric titration of weak acid(acetic acid) with strong base( NaOH).- Determination of acid dissociation constant ($K_a$ ) of weak acid.

**3. Conductometry:**

a) Determination of overall order: Saponification of ethyl acetate with NaOH by conductance measurements.

**TELANGANA STATE COUNCIL OF HIGHER EDUCATION**

**B.Sc. (Computer Science) Course Structure**

(Common Core Syllabus for All Universities of Telanagana State for the Students Admitted from the Academic Year: 2019-20 Batch Onwards)

**CBCS Pattern in Semester System – 2019**

| Paper | Semester | Course Title | Hours / week | | Credits |
|---|---|---|---|---|---|
| | | | Theory | Practical | |
| DSC – I | I | Programming in C | 4 | 3 | 4 + 1 = 5 |
| DSC – II | II | Programming in C++ | 4 | 3 | 4 + 1 = 5 |
| DSC – III | III | Data Structures Using C++ | 4 | 3 | 4 + 1 = 5 |
| DSC – IV | IV | Data Base Management Systems (DBMS) | 4 | 3 | 4 + 1 = 5 |
| DSC – V | V | Programming in Java | 4 | 3 | 4 + 1 = 5 |
| DSC – VI | VI | Web Technologies | 4 | 3 | 4 + 1 = 5 |

| Paper | Semester | Course Title | Hours / week | | Credits |
|---|---|---|---|---|---|
| | | | Theory | Practical | |
| SEC – I | III | Python – I | 2 | | 2 |
| SEC – II | III | Operating Systems - I | 2 | | 2 |
| SEC – III | IV | Python – II | 2 | | 2 |
| SEC – IV | IV | Operating Systems - II | 2 | | 2 |

| Paper | Semester | Course Title | Hours / week | | Credits |
|---|---|---|---|---|---|
| | | | Theory | Practical | |
| AECC | I | Fundamentals of Computer | 2 | | 2 |
| AECC | II | Office Automation | 2 | | 2 |

| Paper | Semester | Course Title | Hours / week | | Credits |
|---|---|---|---|---|---|
| | | | Theory | Practical | |
| GENERAL ELECTIVE (GE) | IV | Information Technologies | 4 | | 4 |

**PROJECT / OPTINAL**

| Paper | Semester | Course Title | Hours / week | | Credits |
|---|---|---|---|---|---|
| | | | Theory | Practical | |
| PROJECT / OPTINAL | VI | PHP with MYSQL | 3 | 3 | 3 + 1 = 4 |

## Programming in C (Semester – I)

**Theory: 4 Hrs/Wk (4 Credits)**
**Practical: 3 Hrs/Wk (1 Credit)** **Total Credits: 4+1 = 5 Credits**

## C – Lab

**Practical: 3 Hrs/Wk (1 Credits)**

1. Write a program to find the largest two (three) numbers using if and conditional operator.
2. Write a program to print the reverse of a given number.
3. Write a program to print the prime number from 2 to n where n is given by user.
4. Write a program to find the roots of a quadratic equation using switch statement.
5. Write a program to print a triangle of stars as follows (take number of lines from user):

```
    *
   ***
  *****
 *******
*********
```

6. Write a program to find largest and smallest elements in a given list of numbers.
7. Write a program to find the product of two matrices
8. Write a program to find the GCD of two numbers using iteration and recursion
9. Write a program to illustrate use of storage classes.
10. Write a program to demonstrate the call by value and the call by reference concepts
11. Write a program that prints a table indicating the number of occurrences of each alphabet in the text entered as command line arguments.
12. Write a program to illustrate use of data type enum.
13. Write a program to demonstrate use of string functions string.h header file.
14. Write a program that opens a file and counts the number of characters in a file.
15. Write a program to create a structure Student containing fields for Roll No., Name, Class, Year and Total Marks. Create 10 students and store them in a file.
16. Write a program that opens an existing text file and copies it to a new text file with all lowercase letters changed to capital letters and all other characters unchanged.

**Note:**

1. Write the Pseudo Code and draw Flow Chart for the above programs.
2. Recommended to use Open Source Software: GCC on Linux; DevC++ (or) CodeBlocks on Windows 10.

**Programming in C++ (Semester – II)**

**Theory: 4 Hrs/Wk (4 Credits)**
**Practical: 3 Hrs/Wk (1 Credit)** **Total Credits: 4+1 = 5 Credits**

**C++ – Lab**

**Practical: 3 Hrs/Wk (1 Credits)**

1. Write a program to print the sum of digits of a given number.
2. Write a program to check whether the given number is Armstrong or not
3. Write a program to print the prime number from 2 to n where n is natural number given.
4. Write a program to find largest and smallest elements in a given list of numbers and sort the given list.
5. Write a program to read the student name, roll no, marks and display the same using class and object.
6. Write a program to implement the dynamic memory allocation and de-allocation using new and delete operators using class and object.
7. Write a program to find area of a rectangle, circle, and square using constructors.
8. Write a program to implement copy constructor.
9. Write a program using friend functions and friend class
10. Write a program to implement default Constructor.
11. Write a program to implement parameterized Constructor
12. Write a program to implement Copy Constructor
13. Write a program to define the constructor inside/outside of the class
14. Write a program to implement all three constructors within a single class as well as use multiple classes( individual classes)
15. Write a program to implement the following concepts using class and object
    a. Function overloading
    b. Operator overloading (unary/binary(+ and -))
16. Write a program to demonstrate single inheritance, multilevel inheritance and multiple inheritances.
17. Write a program to implement the overloaded constructors in inheritance.
18. Write a program to implement the polymorphism and the following concepts using class and object.
    a. Virtual functions
    b. Pure virtual functions
19. Write a program to implement the virtual concepts for following concepts
    a. Constructor (not applied)
    b. Destructor (applied)
20. Write a program to demonstrate static polymorphism using method overloading.
21. Write a program to demonstrate dynamic polymorphism using method overriding and dynamic method dispatch.
22. Write a program to implement the template (generic) concepts
    a. Without template class and object
    b. With template class and object

**Note:**

1. Write the Pseudo Code and draw Flow Chart for the above programs.
2. Recommended to use Open Source Software: GCC on Linux; DevC++ (or) CodeBlocks on Windows 10.

**Data Structures using C++ (Semester – III)**

**Theory: 4 Hrs/Wk (4 Credits)**
**Practical: 3 Hrs/Wk (1 Credit)** **Total Credits: 4+1 = 5 Credits**

**Data Structures using C++ – Lab**

**Practical: 3 Hrs/Wk (1 Credits)**

1. Write C++ programs to implement the following using an array
   a) Stack ADT b) Queue ADT
2. Write a C++ program to implement Circular queue using array.
3. Write C++ programs to implement the following using a single linked list.
   a) Stack ADT b) Queue ADT
4. Write a C++ program to implement Circular queue using Single linked list.
5. Write a C++ program to implement the double ended queue ADT using double linked list.
6. Write a C++ program to solve tower of Hanoi problem recursively
7. Write C++ program to perform the following operations:
   a) Insert an element into a binary search tree.
   b) Delete an element from binary search tree.
   c) Search for a key in a binary search tree.
8. Write C++ programs for the implementation tree traversal technique BFS.
9. Write a C++ program that uses recursive functions to traverse a binary search tree.
   a) Pre-order b) In-order c) Post-order
10. Write a C++ program to find height of a tree.

11 Write a C++ program to find MIN and MAX element of a BST.

12 Write a C++ program to find Inorder Successor of a given node.

13. Write C++ programs to perform the following operations on B-Trees and AVL Trees.
    a) Insertion b) Deletion

14 Write C++ programs for sorting a given list of elements in ascending order using the following sorting methods.
   a) Quick sort b) Merge sort

15. Write a C++ program to find optimal ordering of matrix multiplication.
16. Write a C++ program that uses dynamic programming algorithm to solve the optimal binary search tree problem
17. Write a C++ program to implement Hash Table
18. Write C++ programs to perform the following on Heap
    a) Build Heap b) Insertion c) Deletion
19. Write C++ programs to perform following operations on Skip List
    a) Insertion b) Deletion
20. Write a C++ Program to Create a Graph using Adjacency Matrix Representation.
21. Write a C++ program to implement graph traversal techniques
    a) BFS b) DFS
22. Write a C++ program to Heap sort using tree structure.

**Note:**

- Programs of all the Concepts from Text Book including exercises must be practice and execute.
- In the external lab examination student has to execute two programs with compilation and deployment steps are necessary.
- External Vice-Voce is compulsory.

**Data Base Management Systems (Semester – IV)**

**Theory: 4 Hrs/Wk (4 Credits)**
**Practical: 3 Hrs/Wk (1 Credit)** **Total Credits: 4+1 = 5 Credits**

**Data Base Management Systems – Lab**

**Practical: 3 Hrs/Wk (1 Credits)**

1. Create a database having two tables with the specified fields, to computerize a library system of a University College.
   LibraryBooks (Accession number, Title, Author, Department, PurchaseDate, Price),
   IssuedBooks (Accession number, Borrower)

   a) Identify primary and foreign keys. Create the tables and insert at least 5 records in each table.
   b) Delete the record of book titled "Database System Concepts".
   c) Change the Department of the book titled "Discrete Maths" to "CS".
   d) List all books that belong to "CS" department.
   e) List all books that belong to "CS" department and are written by author "Navathe".
   f) List all computer (Department="CS") that have been issued.
   g) List all books which have a price less than 500 or purchased between "01/01/1999" and "01/01/2004".

2. Create a database having three tables to store the details of students of Computer Department in your college.
   Personal information about Student (College roll number, Name of student, Date of birth, Address, Marks(rounded off to whole number) in percentage at 10 + 2, Phone number)
   Paper Details (Paper code, Name of the Paper)
   Student's Academic and Attendance details (College roll number, Paper Code, Attendance, Marks in home examination).

   a) Identify primary and foreign keys. Create the tables and insert at least 5 records in each table.
   b) Design a query that will return the records (from the second table) along with the name of student from the first table, related to students who have more than 75% attendance and more than 60% marks in paper2.
   c) List all students who live in "Warangal" and have marks greater than 60 in paper1.
   d) Find the total attendance and total marks obtained by each student.
   e) List the name of student who has got the highest marks in paper2.

3. Create the following tables and answer the queries given below:
   Customer (CustID, email, Name, Phone, ReferrerID)
   Bicycle (BicycleID, DatePurchased, Color, CustID, ModelNo)
   BicycleModel(ModelNo, Manufacturer, Style)
   Service (StartDate, BicycleID, EndDate)
   a) Identify primary and foreign keys. Create the tables and insert at least 5 records in each table.
   b) List all the customers who have the bicycles manufactured by manufacturer "Honda".
   c) List the bicycles purchased by the customers who have been referred by Customer "C1".
   d) List the manufacturer of red colored bicycles.
   e) List the models of the bicycles given for service.

4. Create the following tables, enter at least 5 records in each table and answer the queries given below.
   Employee (Person_Name, Street, City)
   Works (Person_Name, Company_Name, Salary)
   Company (Company_Name, City)

Manages (Person_Name, Manager_Name )

a) Identify primary and foreign keys.
b) Alter table employee, add a column “email” of type varchar(20).
c) Find the name of all managers who work for both Samba Bank and NCB Bank.
d) Find the names, street address and cities of residence and salary of all employees who work for “Samba Bank” and earn more than $10,000.
e) Find the names of all employees who live in the same city as the company for which they work.
f) Find the highest salary, lowest salary and average salary paid by each company.
g) Find the sum of salary and number of employees in each company.
h) Find the name of the company that pays highest salary.

5. Create the following tables, enter at least 5 records in each table and answer the queries given below.

   Suppliers (SNo, Sname, Status, SCity)
   Parts (PNo, Pname, Colour, Weight, City)
   Project (JNo, Jname,Jcity)
   Shipment (Sno, Pno, Jno, Qunatity)

   a) Identify primary and foreign keys.
   b) Get supplier numbers for suppliers in Paris with status>20.
   c) Get suppliers details for suppliers who supply part P2. Display the supplier list in increasing order of supplier numbers.
   d) Get suppliers names for suppliers who do not supply part P2.
   e) For each shipment get full shipment details, including total shipment weights.
   f) Get all the shipments where the quantity is in the range 300 to 750 inclusive.
   g) Get part nos. for parts that either weigh more than 16 pounds or are supplied by suppliers S2, or both.
   h) Get the names of cities that store more than five red parts.
   i) Get full details of parts supplied by a supplier in Hyderabad.
   j) Get part numbers for part supplied by a supplier in Warangal to a project in Chennai.
   k) Get the total number of project supplied by a supplier (say, S1).
   l) Get the total quantity of a part (say, P1) supplied by a supplier (say, S1).

6. Write a PL/SQL Program to demonstrate Procedure.
7. Write a PL/SQL Program to demonstrate Function.
8. Write a PL/SQL program to Handle Exceptions.
9. Write a PL/SQL Program to perform a set of DML Operations.
10. Create a View using PL/SQL program.
11. Write a PL/SQL Program on Statement Level Trigger.
12. Write a PL/SQL Program on Row Level Trigger.

**Note:**

- Programs of all the Concepts from Text Book including exercises must be practice and execute.
- In the external lab examination student has to execute two programs with compilation and deployment steps are necessary.
- External Vice-Voce is compulsory.

**Programming in Java (Semester – V)**

**Theory: 4 Hrs/Wk (4 Credits)** **Practical: 3 Hrs/Wk (1 Credits)**
**Practical: 3 Hrs/Wk (1 Credit)** **Total Credits: 4+1 = 5 Credits**

## Programming in Java – Lab

1. Write a program to find the largest of n natural numbers.
2. Write a program to find whether a given number is prime or not.
3. Write a menu driven program for following:
   a. Display a Fibonacci series
   b. Compute Factorial of a number
4. Write a program to check whether a given number is odd or even.
5. Write a program to check whether a given string is palindrome or not.
6. Write a program to print the sum and product of digits of an Integer and reverse the Integer.
7. Write a program to create an array of 10 integers. Accept values from the user in that Array. Input another number from the user and find out how many numbers are equal to the number passed, how many are greater and how many are less than the number passed.
8. Write a program that will prompt the user for a list of 5 prices. Compute the average of the prices and find out all the prices that are higher than the calculated average.
9. Write a program in java to input N numbers in an array and print out the Armstrong numbers from the set.
10. Write java program for the following matrix operations:
    a. Addition of two matrices
    b. Transposeof a matrix
11. Write a java program that computes the area of a circle, rectangle and a Cylinder using function overloading.
12. Write a Java program for the implementation of multiple inheritance using interfaces to calculate the area of a rectangle and triangle.
13. Write a java program to create a frame window in an Applet. Display your name, address and qualification in the frame window.
14. Write a java program to draw a line between two coordinates in a window.
15. Write a java program to display the following graphics in an applet window.
    a. Rectangles b. Circles
    c. Ellipses d. Arcs e. Polygons
16. Write a program that reads two integer numbers for the variables a and b. If any other character except number (0-9) is entered then the error is caught by NumberFormatException object. After that ex.getMessage () prints the information about the error occurring causes.
17. Write a program for the following string operations:
    a. Compare two strings b. concatenate two strings c. Compute length of a string

18. Create a class called Fraction that can be used to represent the ratio of two integers. Include appropriate constructors and methods. If the denominator becomes zero, throw and handle an exception.

**Note:**

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- In the external lab examination student has to execute two programs with compilation and deployment steps are necessary.
- External Vice-Voce is compulsory.

**B.Sc. (Computer Science)**

**Web Technologies (Semester – VI)**

**Theory: 4 Hrs/Wk (4 Credits)**
**Practical: 3 Hrs/Wk (1 Credit)** **Total Credits: 4+1 = 5 Credits**

**Web Technologies – Lab**

**Practical: 3 Hrs/Wk (1 Credits)**

1. Write a HTML program using basic text formatting tags, <p>, <br>, <pre>.
2. Write a HTML program by using text formatting tags.
3. Write a HTML program using presentational element tags <b>, <i>, <strike>, <sup>, <sub>, <big>, <small>, <hr>
4. Write a HTML program using phrase element tags <blockquote>, <cite>, <abbr>, <acronym>, <kbd>, <address>
5. Write a HTML program using different list types.
6. Create a HTML page that displays ingredients and instructions to prepare a recipe.
7. Write a HTML program using grouping elements <div> and <span>.
8. Write a HTML Menu page for Example cafe site.
9. Write a HTML program using images, audios, videos.
10. Write a HTML program to create your time table.
11. Write a HTML program to create a form using text inputs, password inputs, multiple line text input, buttons, check boxes, radio buttons, select boxes, file select boxes.
12. Write a HTML program to create frames and links between frames.
13. Write a HTML program to create different types of style sheets.
14. Write a HTML program to create CSS on links, lists, tables and generated content.
15. Write a HTML program to create your college web site using multi column layouts.
16. Write a HTML program to create your college web site using for mobile device.
17. Write a HTML program to create login form and verify username and password.
18. Write a JavaScript program to calculate area of rectangle using function.
19. Write a JavaScript program to wish good morning, good afternoon, good evening depending on the current time.
20. Write a JavaScript program using switch case?
21. Write a JavaScript program to print multiplication table of given number using loop.
22. Write a JavaScript programs using any 5 events.
23. Write a JavaScript program using JavaScript built in objects.
24. Write a JavaScript program to create registration Form with Validations.
25. Write a XML Program to represent Student Data using DTD.
26. Write a XML Program to represent Data using XML Schema Definition.

# Approved Syllabus

for

**B.A. (Computer Applications) &**
**B.Sc. (B.Z. Computer Applications)**

**Satavahana University,**
**Karimnagar**

Under Choice Based Credit System

**2016**

**Practical Question Bank**

# I Semester

## PRACTICALS

**Note: Practice the following programs in open source software like UBUNTU**

**1.** Create a Word document for a purchase order to be placed with M/s Sham Sunder & Co., Mumbai-01 requesting to supply the following items by rail parcel:

i. 50 meters of green curtain cloth

ii. 10 numbers of white bed sheets

iii. 100 no of table cloths

Use Tab key to move the cursor to the next tab position. By Default, Tabs are set to every 0.5 –inch position. Save the document and name it Model.Doc

**2.** Create the following Word document. Format the title of the document with the following specifications: 14 point Arial font with bold and italic styles. Use the 10point Times New Roman font for rest of the text, except the bulleted paragraphs.

For bulleted paragraphs, use 10 point Courier New font. Leave a gap of 12 points after the title and 6 points after the first paragraph.

Drivers Handbook

No person is permitted to drive a motor vehicle on the road unless he/she holds a valid drivers license for the type of vehicle being driven. The driving licences are classified in the following categories:

- Scooters/Motorcycles
- Cars heavy vehicles
- Cranes

**3.** Create a word document file and type the following equations:

$10X+Y^2$ $X^3+3Y=40$ and $C+O_2=CO_2$

**4.** Prepare a table in MS Word document and print it:

| Name of the Post | Scale of Pay | Minimum Experience |
|---|---|---|
| Scientist/Engineer Gr. 'SB' | 60000-90000 | 1 |
| Scientist/Engineer Gr. 'SC' | 70000-100000 | 2 |
| Scientist/Engineer Gr. 'SA' | 100000-150000 | 8 |

Select the first (title)row and format it in 12 point bold characters. Add another column -"Max age' before the 'Scale of Pay'

5. Type the following in a document. Then sort the list in the ascending order of the examination level. Save the sorted list in a file. Name this file Exams.Doc

| Name of the Examination | No. Of Students Appeared |
|---|---|
| C Level | 2120 |
| B Level. | 3567 |
| Level | 7899 |

6. Create a letter document for informing the candidates about their appointment in XYZ Company. This letter will have to be sent to the following candidates also:

| | |
|---|---|
| Mr.G.P Gupta | Mr.B.N Malhotra |
| S-332, | 6,Hydevale Cottage, |
| Swaroop Nagar | Annadale Road |
| Kanpur-208 001 | Shimla-171004 |
| Mr.B.Ramesh | Ms.Vibha Swami |
| 54,8th Cross road, | D-974, |
| Malleswaram, | Tagore Garden Extension |
| Bangalore-560003 | New Delhi-110027 |

Convert the letter to a Mail Merge document and try to print four letters addressed to the above addresses.

7. Create an EXCEL Worksheet with the following data:

ORIENT INDUSTRIES LTD

| Item | Quantity | Unit price | Gross value |
|---|---|---|---|
| PC | 2 | 30500 | |
| Printer | 2 | 16000 | |
| Diskette | 40 | 30 | |

Carryout the following:

a) Change the width of column A to 12

b) Right justify all text entries in row 2 in column B, C and D

c) Enter formulas in cells D6 and D7 to calculate Gross value for printer and Diskette

d) Enter Total in cell A9.Calculate the sum of the quantity column in cell B9 using SUM function

**12.** Using MS Excel Construct a Percentage Bar Diagram for the following Data:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Year : | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
| Profits of A(Rs.'000) : | 10 | 20 | 32 | 28 | 45 | 56 | 76 | 85 |
| Profits of B(Rs.'000) : | 25 | 28 | 30 | 32 | 40 | 65 | 80 | 100 |

**13.** Construct a pie chart for the following Data:

| | | | | | |
|---|---|---|---|---|---|
| Items : | Food | Cloths | Education | Medicine | Misc |
| Expenditure : | 2500 | 500 | 4500 | 1000 | 1500 |

**14.** Mr. Mohan Kumar intends to take a loan of Rs. 300000 for constructing a house. The finance company charges 12.5% interest per annum, Calculate a table to show the monthly installment required to pay off this loan in 120,132,144,156 and 180 months

**15.** Create a word document for the following data:

(i) $p(r) = {}^{n}C_{r} q^{n-r} p^{r}$ (ii) $\frac{\Sigma xy}{\sqrt{\Sigma x^2 \Sigma y^2}} = r$

**16.** Explain and execute the following DOS Commands

a) Directory
b) Sub Directory
c) Copy Con
d) Ren
e) Del

**17.** Explain and execute the following DOS Commands

a) Backup
b) Restore
c) Tree
d) Print
e) Label

**18.** The Department of Commerce and business management of your college is organizing a TWO-Day National Seminar on "Emerging Dimensions of Indian Retailing-Problems and Prospects" in Collaboration with University grants commission, New Delhi on 21st and 22nd February 2014. Using MS Power Point, prepare a slide display. Prepare three slides each with a different design.

**8.** Create an EXCEL Worksheet with the following data:

ORIENT INDUSTRIES LTD

| Item | Quantity | Unit price | Gross value |
|---|---|---|---|
| PC | 2 | 30500 | |
| Printer | 2 | 16000 | |
| Diskette | 40 | 30 | |

a) Insert blank row before row 1.

b) Enter the sum function in cell D10 to calculate the total of Gross Values for the three items

c) Insert a row before row 8 that contains details about Diskette

d) Enter Ribbon as item in cell A8, 5 as quantity in cell B8 and 150 as Unit price in cell C8.

e) Copy the formula from cell D7 toD8.

**9.** Create an EXCEL Worksheet with the following data:

ORIENT INDUSTRIES LTD

| Item | Quantity | Unit price | Gross value |
|---|---|---|---|
| PC | 2 | 30500 | |
| Printer | 2 | 16000 | |
| Diskette | 40 | 30 | |

Carryout the following:

a) Format 'Orient Industries' entered in cell B2 in bold letters

b) Show Orient Industries' in 14 point Times new Roman font

c) Show the text entries in the range A4-d5 in bold letters

d) Use the Format Cells dialog box to show a thick line above range A4:D4

e) Format the range C6:C9 in the comma format with no decimal places

f) Format the range D6-D11 in the currency format with no decimal places.

**10.** Construct a Line graph for the following Data:

| Year : | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|
| Profits of A(Rs.'000) : | 10 | 20 | 32 | 28 | 45 | 56 | 76 | 85 |
| Profits of B(Rs.'000) : | 25 | 28 | 30 | 32 | 40 | 65 | 80 | 100 |

**11.** Using MS Excel Construct a Stacked Bar Diagram for the following Data:

| Year : | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|
| Profits of A(Rs.'000) : | 10 | 20 | 32 | 28 | 45 | 56 | 76 | 85 |
| Profits of B(Rs.'000) : | 25 | 28 | 30 | 32 | 40 | 65 | 80 | 100 |

**19.** The Department of Commerce and business management of your college is organizing a TWO-Day National Seminar on "Emerging Dimensions of Indian Retailing-Problems and Prospects" in Collaboration with University grants commission, New Delhi on 21st and 22nd February 2014. Using MS Power Point, prepare a slide display. Prepare three slides each with different color background.

**20.** The Department of Commerce and business management of your college is organizing a TWO-Day National Seminar on "Emerging Dimensions of Indian Retailing-Problems and Prospects" in Collaboration with University grants commission, New Delhi on 21st and 22nd February 2014. Using MS Power Point, prepare a slide display. Prepare three slides each with a different animation.

II Semester

## PRACTICALS

**Note: Practice the following programs in open source software like UBUNTU**

1. Write a program to determine the largest of three numbers?
2. Write a program to print Fibonacci series on N numbers?
3. Write a program to check weather given number is palindrome or not?
4. Write a program to find the area of a triangle?
5. Write a program to determine the roots of a quadratic equation?
6. If a five digit number is input through keyboard Write a program to find the sum of its digits?
7. Write a program to print all ASCII values and their equivalent characters using a while loop? The ASCII values vary from 0 to 255?
8. Write a program to print all the Armstrong numbers between 1 and 500?
9. Write a program to display the prime factors of a given number?
10. Write a program to calculate the factorial of a number using recursion?
11. Write a program to locate an element in an array, using linear search?
12. Write a program to locate an element in an array, using binary search?
13. Write a macro definition to determine whether the character entered is small case letter or not?
14. Write a program to accept your name and then

a) Display it in upper case?

b) Display its length in characters?

c) Display its reverse?

15. Write a program to check weather given string is palindrome or not?
16. Write a program to concatenate 2 strings?
17. Write a program to swap two numbers using pointers?
18. Write a program to find the smallest element in an array using pointers?
19. Write a program to process student records using structures?
20. Write a program to illustrate nesting of structures?

Reference Books:


1. ANSI C BY BALAGURUSAMY: McGraw Hill Education
2. LET US C BY YASHWANT KANETKAR: BPB PUBLICATIONS

**Lab Programs:**

**SECTION - A**

**Note : Create Customer table, Employee table, Department table.**

**Exercise-1**

1. Create a query to display the customer number, first name, last name, primary phone number, secondary phone number.
2. Create a query to display first name, last name, join date, monthly discount, monthly discount after an addition of 20% and monthly discount after a reduction of 20% .
3. Create a query to display the last name concatenated with the first name, separated by space, and main phone number concatenated with secondary phone number, separated by comma and space. Name the column heading FULL_NAME and CONTACT_DETAILS respectively.
4. Create a query to display unique cities from the *Customer* table.
5. Create a query to display unique states from the *Customer* table.
6. Create a query to display the last name concatenated with the state, separated by space. Name this column CUSTOMER_AND_STATE (*Customer* table)

**Exercise-2**

1. Display last name, job id and hire date for all employees who was hired during December 12th, 1995 and April 17th, 1998.
2. Display the first name concatenated with last name, hire date, commission percentage, telephone, and salary for all employees whose salary is greater than 10000 **or** the third digit in their phone number equals 5. Sort the query in a descending order by the first name (*Employees* table).
3. Display the last name and salary for all employees who earn more than 12000 (*Employees* table).
4. Display the last name and department number for all employees whose department number is equal to 50 or 80. Perform this exercise once by using the IN operator, once by using the OR operator.

5. Display the first name and salary for all employees who doesn't earn any commission.
6. Display the first name, salary, and manager number for all employees whose manager number is not null.

**Exercise-3**

1. Display the customer number, first name in lowercase and last name in uppercase for all customers whose customer number is in the range of 80 and 150.
2. Generating Email Addresses
   a. For all customers – display the last name, first name and email address. The email address will be composed from the first letter of first name concatenated with three <u>first</u> letters of last name concatenated with the string "@mymail.com" (For example : Ram Kedem → RKED@mymail.com).
   b. For all customers – display the last name, first name and email address. The email address will be composed from the first letter of first name concatenated with three <u>last</u> letters of last name concatenated with the string "@mymail.com" (For example : Ram Kedem → RDEM@mymail.com).
3. Display the last name and the length of the last name for all customers where last name's length is greater than 9 characters.
4. Phone Numbers :
   a. Display the first name, last name, main phone number and a new phone number using the REPLACE function. In the new phone number replace <u>all occurrences</u> of "515" with "$$$".
   b. Display the first name, last name, main phone number and new phone number using the REPLACE function. In the new phone number replace <u>all prefixes</u> of "515" with "$$$" (only if the first 3 digits of the phone number contains the digits "515" replace those digits with "$$$").

**Exercise-4**

1. Employees and departments (*Employees* & *Departments* tables)
    a. For each employee, display the first name, last name, department number and department name.
    b. Display the first name, last name, department number and department name, for all employees in departments 50 or 90.
2. Departments and locations (*Departments*, Employees & *Locations* tables)
    a. For each department, display the department name, city, and state province.
    b. For each employee, display the full name, department name, city, and state province.
    c. Display the full name, department name, city, and state province, for all employees whose last name contains the letter *a*.

## SECTION -B

**Solve the following Questions**

1. Write a PL/SQL Block to demonstrate conditional statements.
2. Write a PL/SQL Block to demonstrate basic loop and while loop
3. Write a PL/SQL Block to find factorial using function
4. Write a PL/SQL Block to swap numbers using procedure.
5. Write a PL/SQL Block to demonstrate pre-defined exception
6. Write a PL/SQL Block to demonstrate cursor.
7. Write a PL/SQL Block to demonstrate trigger
8. Write a PL/SQL Block to demonstrate Package.

**IV Semester**

## Computer lab- Practical Question Bank

1. Create a Web Page which Show different level of Heading and Set background color as Yellow.
2. Create a web page with various text formatting tags (Bold, Italic, Underline, Small and Big)
3. Write a program to change the font face, color and size using font tag.
4. Write program for presenting address.
5. Create a web page with various attributes of DIV and SPAN tags.
6. Create a web page and present the format as shown using PRE tag.

| HTNO | NAME | CLASS |
|---|---|---|
| 1 | RAMU | BSC |
| 2 | SEENU | BSC |
| 3 | HARI | BSC |
| 4 | SHANKAR | BSC |

7. Write a program to scroll text SATAVAHANA UNIVERSITY :: KARIMNAGAR. Left to Right with background color PINK.
8. Write a program to use NOBR and DFN tags
9. Write a program to create ordered list of vegetables
10. Write a program to create unordered list of fruits
11. Write a program for nested list
12. Create a webpage and insert an image with width 500 And height 300 with border color as Red, give the title as IMAGE.
13. Write a program for creating hyperlink to open a document
14. Write a program to display the images with different sizes using hyperlinks.
15. Create a web page with five popular web site hyperlinks with background as image, title as POPULAR LINKS.
16. Write a program to create table column spanning with center alignment

<table>
<tr><td colspan="2" align="center">SATAVAHANA UNIVERSITY</td></tr>
<tr><td align="center">KARIMNAGAR</td><td align="center">TELANGANA</td></tr>
</table>

17. Write a program to create the table as shown.

| SNO | NAME | MARKS |
|---|---|---|
| 1 | SRINIVAS | 200 |
| 2 | RAMARAO | 300 |
| 3 | SATEESH | 300 |
| 4 | HAREESH | 400 |

18. Write a program to create table row spanning with various alignment

<table>
<tr><td rowspan="2">SATAVAHANA UNIVERSITY</td><td>KARIMNAGAR</td></tr>
<tr><td>TELANGANA</td></tr>
</table>

19. Write a program to create the table as shown and set colors

| SNO | NAME | MARKS |
|---|---|---|
| 1 | RAVI | 200 |
| 2 | SHEKAR | 300 |
| 3 | RAJESH | 300 |
| 4 | RAGHU | 400 |

20. Create a web page which shows vertical frame set with different documents. Use frame column set as 25%50%25%.
21. Create a web page which shows horizontal frame set with 3 different documents. Use frame column set as 25%50%25%.
22. Create a web page with mixed framesets rows and columns.
23. Create a web page which plays an mp3 file when open file
    a) Give header as “AUDIO PLAYER” in pink color
    b) Give background color as yellow
24. Write a program to create external style sheet.
25. Write a program to create embedded style sheet.

***

# V Semester

## Object Oriented Programming with C++ Lab

1. Write a program to.
   a. Print the sum of digits of a given number.
   b. Check whether the given number is Armstrong or not
   c. Print the prime number from 2 to n where n is natural number given.

2.Write a program to find largest and smallest elements in a given list of numbers and sort thegiven list.

3 .Write a program to read the student name, roll no, marks and display the same using classand object.

4. Write a program to implement the dynamic memory allocation and de-allocation using newand delete operators using class and object.

5 .Write a program to find area of a rectangle, circle, and square using constructors.

6. Write a program to implement copy constructor.

7. Write a program using friend functions and friend class.8 .Write a program to implement constructors

- Default Constructor, Parameterized Constructor, Copy Constructor
- Define the constructor inside/outside of the class
- Implement all three constructors within a single class as well as use multiple classes(individual classes)

9. Write a program to implement the following concepts using class and object

- Function overloading
- Operator overloading (unary/binary(+ and -))

10. Write a program to demonstrate single inheritance, multilevel inheritance and multipleinheritances.

11 .Write a program to implement the overloaded constructors in inheritance.

12. Write a program to implement the polymorphism and the following concepts using classand object.

- Virtual functions
- Pure virtual functions

13. Write a program to demonstrate inline functions

14. Write a program to demonstrate static polymorphism using method overloading.

15. Write a program to demonstrate dynamic polymorphism using method overriding anddynamic method dispatch.

16. Write a program to implement the template (generic) concepts

- Without template class and object
- With template class and object

# OPERATING SYSTEMS LAB

1.
   a) Use vi editor to create different files, writing data into files, modifying data in files.
   b) Use different types of Unix commands on the files created in first program.
2. Write shell programs using ‘case’, ‘then’ and ‘if’ & ’else’ statements.
3. Write shell programs using while, do-while and for loop statements.4.
   a) Write a shell script that accepts two integers as its arguments and compute thevalue of first number raised to the power of the second number.
   b) Write a shell script that takes a command –line argument and reports on whetherit is directory, a file, or something else.
5.
   a) Write a shell script that accepts a file name, starting and ending line numbers asarguments and displays all the lines between the given line numbers..
   b) Write a shell script that deletes all lines containing a specified word in one ormore files supplied as arguments to it.
6.
   a) Write a shell script that displays a list of all the files in the current directory towhich the user has read, write and execute permissions.
   b) Develop an interactive script that ask for a word and a file name and then tellshow many times that word occurred in the file.
7. Write a program to simulate the UNIX commands like ls, mv, cp.
8. Write a program to convert upper case to lower case letters of a given ASCII file.
9. Write a program to program to search the given pattern in a file.
10. Write a program to demonstrate FCFS process schedules on the given data.
11. Write a program to demonstrate SJF process schedules on the given data.
12. Write a program to demonstrate Priority Scheduling on the given burst time and arrivaltimes.
13. Write a program to demonstrate Round Robin Scheduling on the given burst time andarrival times.
14. Write a program to implementing Producer and Consumer problem using Semaphores.
15. Write a program to simulate FIFO, LRU, LFU Page replacement algorithms.
16. Write a program to simulate Sequential, Indexed and Linked file allocation.

# VI Semester

## VISUAL PROGRAMMING LAB

1. Print a table of numbers from 5 to 15 and their squares & Cubes.
2. Print the largest of three numbers.
3. Find the factional of a number n.
4. Enter a list of positive numbers terminated by zero. Find the sum and average of thesenumbers.
5. A person deposits Rs. 1000 in a fixed account yielding 5% interest. Complete the amountin the account at the end of each year for n years.
6. Read n numbers. Count the number of negative numbers, positive numbers and zeros inthe list.
7. Read n numbers. Count the number of negative numbers, positive numbers and zeroes inthe list(use arrays)
8. Read a single dimension array. Find the sum and average of these numbers.
9. Read a two dimension array. Find the sum of two 2D Array
10. Write a program to Demonstrate Control Array.
11. Write a Program to perform String Manipulation Operations.
12. Develop a VB Application to check for Input Validations.
13. Develop a VB Application to Demonstrate MDI.
14. Develop a VB Application to Demonstrate Combobox and Listbox.
15. Develop a VB Application to Demonstrate Option Buttons and Check Boxes.
16. Develop a VB Application to deal the following Database Operations

a) Insert

b) Delete

c) Update

d) Display

# Computer Networks Lab

1. Write a program to create a socket and implement connect function.
2. Write a program to get MAC address.
3. Write a program to display hello world using signals.
4. Write a program for socket pair system call using IPC.
5. Write a program to implement the sliding window protocol.
6. Write a program to identify the category of IP address for a given IP address.
7. Write a program to print details of DNS host.
8. Write a program to implement listener and talker.
9. Write a program to implement TCP echo using client–server program.
10. Write a program to implement UDP echo using client–server program.
11. Write a UDP client–server program to convert lowercase letters to uppercase letters.
12. Write a TCP client–server program to convert a given string into reverse.
13. Write a UDP client–server program to convert a given string into reverse.
14. Write a program to implement TCP iterative client–server program.
15. Write a program to implement time service using TCP client–server program.
16. Write a program to implement time service using UDP client–server program.

**Note:** Write above program using ‘C’ or C++

# FACULTY OF COMMERCE

# SATAVAHANA UNIVERSITY, KARIMNAGAR

# B.Com (CA) I SEMESTER

# FUNDAMENTALS OF INFORMATION TECHNOLOGY

**Practical Question Bank W.E.F (2020-2021)**

**MARKS: 20]** **[2 Hrs**

1. Assembling the Computer with Following Units.
   - CPU
   - Monitor
   - Keyboard
   - Mouse
   - Printer
   - Speakers
2. a) Create Directory, sub Directories in DOS.

   Directory - Course

   Sub Directory- Colleges

   Sub Sub Directory- Year

   b) Create Folder, sub Folder and windows.

   Folder - Course

   Sub Folder- Colleges

   Sub Sub Folder- Year

3. Identify Front Panel Indicators, Switches etc.,

4. Identifying external ports and interfacing

5. Install Antivirus Software and Troubleshoot.

6. Install the Printer Drivers for PC.

7. Write about Following

   a) Internet b) WWW c)browser d) Website e) blog

8. Write about Following

   a) Hub b) router c) switch d) modem

8. Connecting the PC to internet using various tools.

9. Create an Email ID for on organization

10. Composing a mail and organizing of Labels in your GMAIL Account?

# FACULTY OF COMMERCE

# SATAVAHANA UNIVERSITY, KARIMNAGAR

# B.Com (CA) III Semester

## Relational Database Management system

### (RDBMS)

**Practical Question Bank W.E.F (2020-2021)**

**Marks:20]** **[2 Hrs**

**Exercise – 1:**

1. Create table EMP with columns emp_num, ename, sal and enter 10 records.
2. Add columns dname,dept_num,location for emp table.
   * After adding columns you need to update data for added columns to existing records
3. Rename the Emp table with Employee and modify the ename column size as 20.
4. Display all the records from employee of dept_num 30
5. Display the employee details whose have 2A's in their name.
6. Drop the column dname and display details of employees whose salary greater than 15000.

**Exercise – 2:**

1. Display the details of employees whose join date is 01/11/2020.
2. Add column job to the employee table and list the clerks in the deptno of 10.
3. Display the details of employee whose salary is less than 10000
4. Display the details of employee salaries in descending order.
5. Display the names of employee in upper case.
6. Display the names of the employees in lower case.

**Exercise – 3:**

1. Find the Dept which has maximum number of employee.
2. List the year in which maximum number of employee was recruited.
3. Display the details of employees who are working for deptno 10 and 20.
4. Update the HRA=15%, DA=10%, TA=10% for all the Employees whose is experience more than 10 years
5. Write a query to delete duplicate records from emp.
6. Display the sum of salaries in department wise.

**Exercise – 4:**

1. Make the duplicate table as emp12 on emp
2. Add Constraint Primary Key for emp_num and dept_num columns for emp table
3. Remove the referential integrity from employee table and dept table.
4. Display the name of Employees who earn the Highest salary in their respective departments.
5. Display the employees whose job as manager.
6. Display the details of employees whose name is ALLEN.

**Exercise – 5:**

1. Display all rows from Emp Table. The System wait after every Screen full of information.
2. Create view for emp table.
3. Create a view for emp table where deptno=10.
4. Drop table the view of emp table.
5. Delete all the records from the emp where the deptname is NULL.
6. Delete the rows of employees whose experience is less than 5 year.

**FACULTY OF COMMERCE**
**SATAVAHANA UNIVERSITY, KARIMNAGAR**

## B.Com (CA) IV Semester

# Web Technologies

**Practical Question Bank W.E.F (2020-2021)**

**Marks:20]** **[2Hrs**

1. Write a HTML program using basic text formatting tags,
2. Write a HML program using <p>, <br>, <pre>., strike>, <sup>, <sub>, <big>, <small>, <hr>
3. Write a HTML program using phrase element tags <blockquote>, <cite>, <abbr>, <acronym>, <kbd>, <address>
4. Write a HTML program using different list types.
5. Write a HTML program using grouping elements <div> and <span>.
6. Write a HTML program using images, audios, videos.
7. Write a HTML program to create your time table using all Table tags.
8. Write a HTML program to create a form using text inputs, password inputs, multiple line text input, buttons.
9. Write a HTML program to create a form using check boxes, radio buttons, select boxes, file select boxes.
10. Write a HTML program to create frames and links between frames.
11. Write a HTML program to create different types of style sheets.
12. Write a HTML program to create login form and verify username and password.
13. Write a JavaScript program to calculate area of rectangle using function.
14. Write a JavaScript program to wish good morning, good afternoon, good evening depending on the current time.
15. Write a JavaScript program to print multiplication table of given number using loop.
16. Write a JavaScript programs using any 5 events.
17. Write a JavaScript program using JavaScript built in objects.

18. Write a JavaScript program to create registration Form with Validations.

# SATAVAHANA UNIVERSITY, KARIMNAGAR

FACULTY OF COMPUTERS SCIENCE & APPLICATIONS

## B.Com (Computer Applications) – III Year

## SEMESTER –VI (Choice Based Credit System)

## E-COMMERCE - COMPUTER LAB PRACTICAL QUESTION BANK

**Total marks: 20** **Record: 5 Marks** **Skill Test: 15 marks**

## E-COMMERCE - *PRACTICAL QUESTIONS*

1. Create a webpage and write a paragraph shown below

   **SATAVAHANA UNIVERSITY**

   Satavahana University is located in historical city, Karimnagar, erstwhile seat of the Satavahana rulers and an important town in North Telangana Region. It has completed 10 years of its existence.

   a) Give background color as gray, text color as blue, font size as five and font style as Arial.
   b) Write header in H1 and underline it as shown
   c) underline the text wherever you find Satavahana
   d) Give background color as orange, text color as blue font size as 5 and font style as Arial.
   e) Draw a horizontal line after the paragraph using attributes as width 750 & height 10 color red.
   f) Create a link to the Satavahana university site www.satavahana.ac.in
2. Create a Web Page with various Attributes of DIV and SPAN Tags.
3. Create a Web Page and Present the format as Shown using PRE Tag

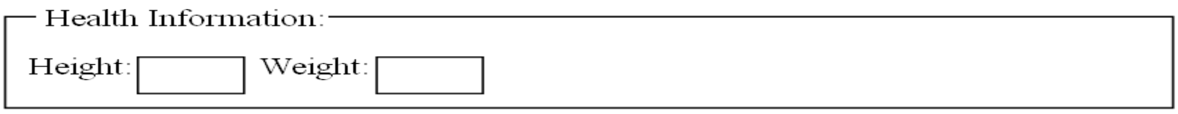
| HTNO | NAME | CLASS |
|---|---|---|
| 1 | Ramesh | B.Com Computer Applications |
| 2 | Sudha | B.Sc. MPCs |
| 3 | Raza | B.Com General |

4. Create a webpage with a paragraph as shown below

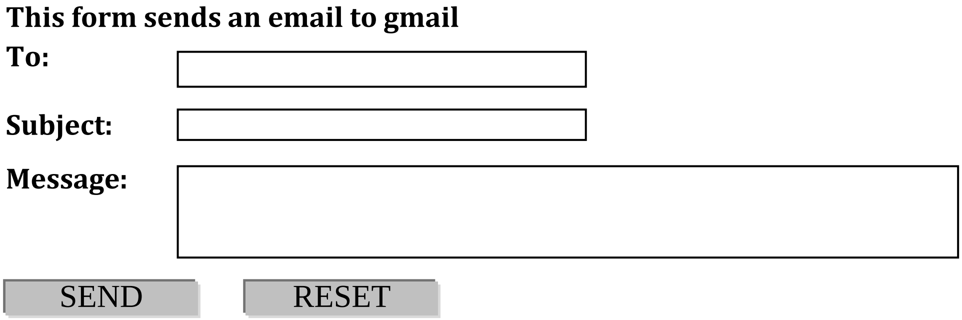
   **SATAVAHANA UNIVERSITY**

   Satavahana University is located in historical city, Karimnagar, erstwhile seat of the Satavahana rulers and an important town in North Telangana Region. It has completed 10 years of its existence.

   a) Write a line as "Satavahana University, Karimnagar, Telangana" and scroll the line from right to left. Use background color as lavender.
5. Create a webpage which show different text formatting with background color as orange, font 20, text color red and give title as "Text formatting"
6. Create a webpage as show below set background color lavender, Title as "HEALTH INFORMATION"




7. Create a webpage containing horizontal frame set with 3 different documents
   a) Use a frame set row set as 20%60%20%
   b) In Second Row of frameset Use a frame set column set as 25%50%25%
8. Write a Program to Create Ordered List and unordered list of Vegetables and fruits.
9. Create a webpage as shown below which sends email from a form



10. Create a webpage as
    a) Write a paragraph which contains an image aligned left side of the paragraph.
    b) Write a paragraph which contains an image aligned right side of the paragraph.
    c) Give background color as lime
11. Prepare a sample code to illustrate links using images
    Link between different sections of the same webpage page,
    Link to different websites
12. Create a webpage which shows different image alignments and show that images in between some text?
    a) Give back ground color as gold.
    b) Give title and header as different image alignments
    c) Make header as center.
13. Write a HTML program using phrase element tags <blockquote>, <cite>, <abbr>, <acronym>, <kbd>, <address>
14. Create a webpage which contain three check boxes and one push button. Set background color of webpage in tan
15. Create a webpage which automatically plays an mp3 file when open that page
    a) Give header as “AUDIO PLAYER” in blue color in H1 range in center
    b) Give background color as tan.
    c) Give title as “audio player”
16. Create a webpage as
    a) Insert an image of Satavahana university with width 500 height 300 and make it center
    b) Write a scroll line as “SATAVAHANA UNIVERSITY, KARIM NAGAR, TELANGANA” with text color white, background color as blue.
    c) Give background color as orange.
    d) Give header as “SATAVAHANA UNIVERSITY” in h1 range and align it to center.
    e) Give title as “SATAVAHANA UNIVERSITY”.
17. Write a HTML program to create your time table
18. Write a Program to Create External Style Sheet.
19. Write a Program to Create Embedded Style Sheet.
20. Create a table with following options
    a) Rowspan & Colspan
    b) Cellpadding & Cellspacing
    c) Caption tag & border
    d) Table Background color, background image
    e) Nested tables

**Chairmen**
**Board of Studies**
**Department of Computer Applications**

Approved By:

# Approved Syllabus

for

# B.Sc. Mathematics

## Satavahana University, Karimnagar

Under Choice Based Credit System

**2016**

# *Syllabus*

DSC-1A DIFFERENTIAL CALCULUS BS:104

Theory: 4 credits and Practicals: 1 credits
Theory: 4 hours /week and Practicals: 2 hours /week

Objective: The course is aimed at exposing the students to some basic notions in differential calculus .

Outcome: By the time students completes the course they realize wide ranging applications of the subject.

Unit- I

Successive differentiation- Expansions of Functions- Mean value theorems

Unit – II

Indeterminate forms – Curvature and Evolutes

Unit – III

Partial differentiation – Homogeneous functions- Total derivative

Unit – IV

Maxima and Minima of functions of two variables – Lagrange's Method of multipliers –Asymptotes- Envelopes

**Text** : Shanti Narayan and Mittal, *Differential Calculus*

**References**: William Anthony Granville, Percey F Smith and William Raymond Longley; *Elements of the differential and integral calculus*

Joseph Edwards , *Differential calculus for beginners*

Smith and Minton, *Calculus*

Elis Pine, *How to Enjoy Calculus*

Hari Kishan ,*Differential Calculus*

# Differential Calculus

## Practicals Question Bank

UNIT-I

1. If $u=\tan^{-1} x$, prove that

$$(1+x^2)\frac{d^2u}{dx^2}+2x\frac{du}{dx}=0$$

and hence determine the values of the derivatives of $u$ when $x=0$

2. If

$y=\sin(m\sin^{-1}x)$, show that

$$(1-x^2)y_{n+2}=(2n+1)xy_{n+1}+(n^2-m^2)y_n$$

and find $y_n(0)$.

3. If $U_n$ denotes the $n$th derivative of $(Lx+M)/(x^2-2Bx+C)$., prove

$$\frac{x^2-2Bx+C}{(n+1)(n+2)}U_{n+2}+\frac{2(x-B)}{n+1}U_{n+1}+U_n=0.$$

14. If $y=x^2e^x$, then

$$\frac{d^ny}{dx^n}=\frac{1}{2}n(n-1)\frac{d^2y}{dx^2}-n(n-2)\frac{dy}{dx}+\frac{1}{2}(n-1)(n-2)y.$$

5. Determine the intervals in which the function

$$(x^4+6x^3+17x^2+32x+32)e^{-x}$$

is increasing or decreasing.

6. Separate the intervals in which the function

$$(x^2+x+1)/(x^2-x+1)$$

is increasing or decreasing.

7. Show that if $x>0$,

(i) $x-\frac{x^2}{2}<\log(1+x)<x-\frac{x^2}{2(1+x)}$.

(ii) $x-\frac{x^2}{2}+\frac{x^3}{3(1+x)}<\log(1+x)<x-\frac{x^2}{2}+\frac{x^3}{3}$.

8. Prove that

$$e^{ax}\sin bx=bx+abx^2+\frac{3a^2b-b^3}{3!}x^3+\dots$$

$$+\frac{(a^2+b^2)^{\frac{1}{2}n}}{n!}x^n\sin\left(n\tan^{-1}\frac{b}{a}\right)+\dots$$

9. Show that $\cos^2 x=1-x^2+\frac{1}{3}x^4-\frac{2}{45}x^6\dots\dots$

10. Show that

$$e^{m\tan^{-1}x}=1+mx+\frac{m^2}{2!}x^2+\frac{m(m^2-2)}{3!}x^3+\frac{m^2(m^2-8)}{4!}x^4+\dots.$$

UNIT-II

1. Find the radius of curvature at any point on the curves

(i) $y=c\cosh(x/c)$ (*Catenary*).

(ii) $x=a(\cos t+t\sin t)$, $y=a(\sin t-t\cos t)$.

(iii) $x^{\frac{2}{3}}+y^{\frac{2}{3}}=a^{\frac{2}{3}}$. (Astroid)

(iv) $x=(a\cos t)/t$, $y=(a\sin t)/t$.

2. Show that for the curve

$$x=a\cos\theta(1+\sin\theta),\ y=a\sin\theta(1+\cos\theta),$$

the radius of curvature is, $a$, at the point for which the value of the parameter is $-\pi/4$.

3. Prove that the radius of curvature at the point $(-2a, 2a)$ on the curve $x^2y=a(x^2+y^2)$ is, $-2a$.

4. Show that the radii of curvature of the curve

$$x=ae^{\theta}\ (\sin\theta-\cos\theta),\ y=ae^{\theta}\ (\sin\theta+\cos\theta),$$

and its evolute at corresponding points are equal.

5. Show that the whole length of the evolute of the ellipse

$$x^2/a^2+y^2/b^2=1$$

is $4(a^2/b-b^2/a)$.

6. Show that the whole length of the evolute of the astroid

$$x=a\cos^3\theta,\ y=a\sin^3\theta$$

is $12a$.

7. Evaluate the following :

(*i*) $\lim\limits_{x\to 0}\dfrac{xe^x-\log(1+x)}{x^2}$. (*D.U. 1952*) (*ii*) $\lim\limits_{x\to 0}\dfrac{x\cos x-\log(1+x)}{x^2}$.
(*D. U. Hons. 1951, P.U. 1957*)

(*iii*) $\lim\limits_{x\to 0}\dfrac{e^x\sin x-x-x^2}{x^2+x\log(1-x)}$. (*D.U. 1953*) (*iv*) $\lim\limits_{x\to 0}\left\{\dfrac{1}{x}-\dfrac{1}{x^2}\log(1+x)\right\}$.
(*D.U. 1955*)

8. If the limit of

$$\frac{\sin 2x+a\sin x}{x^3},$$

as $x$ tends to zero, be finite, find the value of $a$ and the limit.

9. Determine the limits of the following functions :

(*i*) $x\log\tan x$, $(x\to 0)$. (*ii*) $x\tan(\pi/2-x)$, $(x\to 0)$.

(*iii*) $(a-x)\tan(\pi x/2a)$, $(x\to 0)$.

10. Determine the limits of the following functions :

i. $\dfrac{e^x-e^{-x}-x}{x^2\sin x}$, $(x\to 0)$. ii. $\dfrac{\log x}{x^3}$, $(x\to\infty)$.

iii. $\dfrac{1+x\cos x-\cosh x-\log(1+x)}{\tan x-x}$, $(x\to 0)$.

iv. $\dfrac{\log(1+x)\log(1-x)-\log(1-x^2)}{x^4}$, $(x\to 0)$.

UNIT-III

1. If $z=xy\,f(x/y)$, show that

$$x\frac{\partial z}{\partial x}+y\frac{\partial z}{\partial y}=2z.$$

2. If $z(x+y)=x^2+y^2$, show that

$$\left(\frac{\partial z}{\partial x}-\frac{\partial z}{\partial y}\right)^2=4\left(1-\frac{\partial z}{\partial x}-\frac{\partial z}{\partial y}\right).$$

3. If $z=3xy-y^3+(y^2-2x)^{\frac{3}{2}}$, verify that

$$\frac{\partial^2 z}{\partial x\partial y}=\frac{\partial^2 z}{\partial y\partial x}\ \text{and}\ \frac{\partial^2 z}{\partial x^2}\,\frac{\partial^2 z}{\partial y^2}=\left(\frac{\partial^2 z}{\partial x\partial y}\right)^2.$$

4. If $z=f(x+ay)+\varphi(x-ay)$, prove that

$$\frac{\partial^2 z}{\partial y^2}=a^2\frac{\partial^2 z}{\partial x^2}.$$

5. If $u=\tan^{-1}\dfrac{x^3+y^3}{x-y}$, find

$$x^2\frac{\partial^2 u}{\partial x^2}+2xy\frac{\partial^2 u}{\partial x\partial y}+y^2\frac{\partial^2 u}{\partial y^2}.$$

6. If $f(x, y)=0$, $\varphi(y, z)=0$, show that

$$\frac{\partial f}{\partial y}\cdot\frac{\partial\varphi}{\partial z}\cdot\frac{dz}{dx}=\frac{\partial f}{\partial x}\cdot\frac{\partial\varphi}{\partial y}.$$

7. If $x\sqrt{(1-y^2)}+y\sqrt{(1-x^2)}=a$, show that

$$\frac{d^2y}{dx^2}=-\frac{a}{(1-x^2)^{\frac{3}{2}}}.$$

8. Given that

$f(x, y)\equiv x^3+y^3-3axy=0$, show that

$$\frac{d^2y}{dx^2}\cdot\frac{d^2x}{dy^2}=\frac{4a^6}{xy(xy-2a^2)^3}.$$

9. If $u$ and $v$ are functions of $x$ and $y$ defined by

$$x=u+e^{-v}\sin u,\ y=v+e^{-v}\cos u,$$

prove that

$$\frac{\partial u}{\partial y}=\frac{\partial v}{\partial x}.$$

10. *If $H=f(y-z,\ z-x,\ x-y)$ ; prove that,*

$$\frac{\partial H}{\partial x}+\frac{\partial H}{\partial y}-\frac{\partial H}{\partial z}=0.$$

UNIT-IV

1. Find the minimum value of $x^2+y^2+z^2$ when
   (*i*) $x+y+z=3a$.
   (*ii*) $xy+yz+zx=3a^2$.
   (*iii*) $xyz=a^3$.
2. Find the extreme value of $xy$ when

$$x^2+xy+y^2=a^2.$$

3. In a plane triangle, find the maximum value of

$$\cos A\cos B\cos C.$$

4. *Find the envelope of the family of semi-cubical parabolas*

$$y^2-(x+a)^3=0.$$

5. *Find the envelope of the family of ellipses*

$$x^2/a^2+y^2/b^2=1,$$

*where the two parameter $a$, $b$, are connected by the relation*

$$a+b=c\ ;$$

*$c$, being a constant.*

6. *Show that the envelope of a circle whose centre lies on the parabola $y^2=4ax$ and which passes through its vertex is the cissoid*

$$y^2(2a+x)+x^3=0.$$

7. Find the envelope of the family of straight lines $x/a+y/b=1$ where $a$, $b$ are connected by the relation
   (*i*) $a+b=c$. (*ii*) $a^2+b^2=c^2$. (*iii*) $ab=c^2$,
   $c$ is a constant.
8. *Find the asymptotes of*

$$x^3+4x^2y+4xy^2+5x^2+15xy+10y^2-2y+1=0.$$

9. *Find the asymptotes of*

$$x^3+4x^2y+4xy^2+5x^2+15xy+10y^2-2y+1=0.$$

10. Find the asymptotes of the following curves
    i. $xy(x+y)=a(x^2-a^2)$.
    ii. $(x-1)(x-2)(x+y)+x^2+x+1=0$.
    iii. $y^3-x^3+y^2+x^2+y-x+1=0$.

DSC- 1B DIFFERENTIAL EQUATIONS BS:204

Theory: 4 Credits and Practicals: 1 credits
Theory: 4 hours /week and Practicals: 2 hours /week

Objective: The main aim of this course is to introduce the students to the techniques of solving differential equations and to train to apply their skills in solving some of the problems of engineering and science.

Outcomes: After learning the course the students will be equipped with the various tools to solve few types differential equations that arise in several branches of science.

Unit – I

Differential Equations of first order and first degree:
Exact differential equations – Integrating Factors – Change in variables – Total Differential Equations – Simultaneous Total Differential Equations – Equations of the form $dx/P = dy/Q = dz/R$
Differential Equations first order but not of first degree: Equations Solvable for y – Equations Solvable for x – Equations that do not contain x ( or y ) – Clairaut's equation

Unit – II

Higher order linear differential equations: Solution of homogeneous linear differential equations with constant coefficients – Solution of non-homogeneous differential equations P(D)y= Q(x) with constant coefficients by means of polynomial operators when $Q(x)=bx^k, be^{ax}, e^{ax}V, b\cos(ax), b\sin(ax)$

Unit – III

Method of undetermined coefficients – Method of variation of parameters – Linear differential equations with non constant coefficients – The Cauchy – Euler Equation

Unit – IV

Partial Differential equations- Formation and solution- Equations easily integrable – Linear equations of first order – Non linear equations of first order – Charpit's method – Non homogeneous linear partial differential equations – Separation of variables

**Text**: Zafar Ahsan, *Differential Equations and Their Applications*

**References**: Frank Ayres Jr, *Theory and Problems of Differential Equations*

Ford, L.R, *Differential Equations.*

Daniel Murray, *Differential Equations*

S. Balachandra Rao, *Differential Equations with Applications and Programs*

Stuart P Hastings, J Bryce McLead; *Classical Methods in Ordinary Differential Equations*

# Differential Equations
# Practicals Question Bank

## Unit-I

Solve the following differential equations:

1. $y' = \sin(x+y) + \cos(x+y)$

2. $xdy - ydx = a(x^2 + y^2)dy$

3. $x^2ydx - (x^3 + y^3)dy = 0$

4. $(y+z)dx + (x+z)dy + (x+y)dz = 0$

5. $y\sin 2xdx - (1 + y^2 + \cos^2 x)dy = 0$

6. $y + px = p^2x^4$

7. $yp^2 + (x-y)p - x = 0$

8. $\dfrac{dx}{y-zx} = \dfrac{dy}{yz+x} = \dfrac{dz}{x^2+y^2}$

9. $\dfrac{dx}{x(y^2-z^2)} = \dfrac{dy}{y(z^2-x^2)} = \dfrac{dz}{z(x^2-y^2)}$

10. Use the transformation $x^2 = u$ and $y^2 = v$ to solve the equation

$axyp^2 + (x^2 - ay^2 - b)p - xy = 0$.

## Unit-II

Solve the following differential equations:

1. $D^2y + (a+b)Dy + aby = 0$

2. $D^3y - D^2y - Dy - 2y = 0$

3. $D^3y + Dy = x^2 + 2x$

4. $y'' + 3y' + 2y = 2(e^{-2x} + x^2)$

5. $y^{(5)}+2y'''+y'=2x+\sin x+\cos x$

6. $(D^2+1)(D^2+4)y=\cos\frac{x}{2}\cos\frac{3x}{2}$

7. $(D^2+1)y=\cos x+xe^{2x}+e^x\sin x$

8. $y''+3y'+2y=12e^x$

9. $y''-y=\cos x$

10. $4y''-5y'=x^2e^x$

## Unit-III

Solve the following differential equations:

1. $y''+3y'+2y=xe^x$

2. $y''+3y'+2y=\sin x$

3. $y''+y'+y=x^2$

4. $y''+2y'+y=x^2e^{-x}$

5. $x^2y''-xy'+y=2\log x$

6. $x^4y'''+2x^3y''-x^2y'+xy=1$

7. $x^2y''-xy'+2y=x\log x$

8. $x^2y''-xy'+2y=x$

Use the reduction of order method to solve the following homogeneous equation whose one of the solutions is given:

9. $y''-\frac{2}{x}y'+\frac{2}{x^2}y=0$, $y_1=x$

10. $(2x^2+1)y''-4xy'+4y=0$, $y_1=x$

Unit-IV

1. Form the partial differential equation , by eliminating the arbitrary constants from $z=(x^2+a)(y^2+b)$.

2. Find the differential equation of the family of all planes whose members are all at a constant distance $r$ from the origin.

3. Form the differential equation by eliminating arbitrary function $F$ from

$F(x^2+y^2, z-xy)=0$.

Solve the following differential equations:

4. $x^2(y-z)p+y^2(z-x)q=z^2(x-y)$

5. $x(z^2-y^2)p+y(x^2-z^2)q=z(y^2-x^2)$

6. $\left(p^2-q^2\right)z=x-y$

7. $z=px+qy+p^2q^2$

8. $z^2=pqxy$

9. $z^2(p^2+q^2)=x^2+y^2$

10. $r+s-6t=\cos(2x+y)$

SEC-1A

# LOGIC AND SETS

BS: 301

Credits: 2
Theory : 2 hours /week

Objective: Students learn some concepts in set theory and logic.

Outcome: After the completion of the course students appreciate its importance in the development of computer science.

Unit – I

Basic Connectives and truth tables – Logical equivalence : Laws of Logic – Logical Implication : Rules Inference : The Use of Quantifiers – Quantifiers, Definitions, and proofs of Theorems

Unit – II

Sets and Subsets – Set Operations and the Laws of Set Theory – Counting and Venn Diagrams – A First Word on Probability – The axioms of Probability – Conditional Probability: Independence – Discrete Random variables

**Text** : Ralph P Grimaldi, *Discrete and Combinatorial Mathematics (5e)*

**References**: P R Halmos, *Naïve Set Theory*

E Kamke, *Theory of Sets*

SEC-1B THEORY OF EQUATIONS BS: 301

Credits: 2

Theory: 2 hours /week

Objective: Students learn the relation between roots and coefficients of a polynomial equation, ,Descartes's rule of signs in finding the number of positive and negative roots if any of a polynomial equation bsides some other concepts.

Outcome: By using the concepts learnt the students are expected to solve some of the polynomial equations.

Unit I

Graphic representation of a polynomial-Maxima and minima values of polynomials-Theorems relating to the real roots of equations-Existence of a root in the general equation –Imaginary roots-Theorem determining the number of roots of an equation-Equal roots-Imaginary roots enter equations in pairs-Descartes' rule of signs for positive roots- Descartes' rule of signs for negative roots-

Unit II

Relations between the roots and coefficients-Theorem-Applications of the theorem-Depression of an equation when a relation exists between two of its roots-The cube roots of unity-Symmetric functions of the roots-examples.

**Text:** W.S. Burnside and A.W. Panton, *The Theory of Equations*

**References:** C. C. Mac Duffee, Theory *of Equations*

Hall and Knight, *Higher Algebra*

DSC- 1C | REAL ANALYSIS | BS: 304

Theory: 4 credits and Practicals: 1 credits
Theory: 4 hours /week and Practicals: 2 hours /week

Objective: The course is aimed at exposing the students to the foundations of analysis which will be useful in understanding various physical phenomena.

Outcome: After the completion of the course students will be in a position to appreciate beauty and applicability of the course.

Unit – I

Sequences: Limits of Sequences- A Discussion about Proofs-Limit Theorems for Sequences-Monotone Sequences and Cauchy Sequences

Unit – II

Subsequences-Lim sup's and Lim inf's-Series-Alternating Series and Integral Tests

Unit – III

Sequences and Series of Functions: Power Series-Uniform Convergence-More on Uniform Convergence-Differentiation and Integration of Power Series (Theorems in this section without Proofs)

Unit – IV

Integration : The Riemann Integral – Properties of Riemann Integral-Fundamental Theorem of Calculus

**Text**: Kenneth A Ross, *Elementary Analysis-The Theory of Calculus*

**References**: William F. Trench, *Introduction to Real Analysis*
Lee Larson, *Introduction to Real Analysis I*

Shanti Narayan and Mittal. *Mathematical Analysis*

Brian S. Thomson, Judith B. Bruckner, Andrew M. Bruckner; *Elementary Real analysis*

Sudhir R. Ghorpade Balmohan V. Limaye ,*A Course in Calculus and Real Analysis*

# Real Analysis

## Practicals Question Bank

### UNIT-I

**1**

For each sequence below, determine whether it converges and, if it converges, give its limit. No proofs are required.

(a) $a_n = \frac{n}{n+1}$ (b) $b_n = \frac{n^2+3}{n^2-3}$

(c) $c_n = 2^{-n}$ (d) $t_n = 1 + \frac{2}{n}$

(e) $x_n = 73 + (-1)^n$ (f) $s_n = (2)^{1/n}$

**2**

Determine the limits of the following sequences, and then prove your claims.

(a) $a_n = \frac{n}{n^2+1}$ (b) $b_n = \frac{7n-19}{3n+7}$

(c) $c_n = \frac{4n+3}{7n-5}$ (d) $d_n = \frac{2n+4}{5n+2}$

(e) $s_n = \frac{1}{n}\sin n$

**3**

Suppose $\lim a_n = a$, $\lim b_n = b$, and $s_n = \frac{a_n^3+4a_n}{b_n^2+1}$. Prove $\lim s_n = \frac{a^3+4a}{b^2+1}$ carefully, using the limit theorems.

---

**4**

Let $x_1 = 1$ and $x_{n+1} = 3x_n^2$ for $n \geq 1$.

(a) Show if $a = \lim x_n$, then $a = \frac{1}{3}$ or $a = 0$.

(b) Does $\lim x_n$ exist? Explain.

(c) Discuss the apparent contradiction between parts (a) and (b)

**5**

Which of the following sequences are increasing? decreasing? bounded?

(a) $\frac{1}{n}$ (b) $\frac{(-1)^n}{n^2}$

(c) $n^5$ (d) $\sin(\frac{n\pi}{7})$

(e) $(-2)^n$ (f) $\frac{n}{3^n}$

**6**

Let $(s_n)$ be a sequence such that

$$|s_{n+1} - s_n| < 2^{-n} \quad \text{for all} \quad n \in \mathbb{N}.$$

Prove $(s_n)$ is a Cauchy sequence and hence a convergent sequence.

**7**

Let $(s_n)$ be an increasing sequence of positive numbers and define $\sigma_n = \frac{1}{n}(s_1 + s_2 + \cdots + s_n)$. Prove $(\sigma_n)$ is an increasing sequence.

**8**

Let $t_1 = 1$ and $t_{n+1} = [1 - \frac{1}{4n^2}] \cdot t_n$ for $n \geq 1$.

(a) Show $\lim t_n$ exists.

(b) What do you think $\lim t_n$ is?

9

Let $t_1 = 1$ and $t_{n+1} = [1 - \frac{1}{(n+1)^2}] \cdot t_n$ for $n \geq 1$.

(a) Show $\lim t_n$ exists.

(b) What do you think $\lim t_n$ is?

(c) Use induction to show $t_n = \frac{n+1}{2n}$.

(d) Repeat part (b).

10

Let $s_1 = 1$ and $s_{n+1} = \frac{1}{3}(s_n + 1)$ for $n \geq 1$.

(a) Find $s_2$, $s_3$ and $s_4$.

(b) Use induction to show $s_n > \frac{1}{2}$ for all $n$.

(c) Show $(s_n)$ is a decreasing sequence.

(d) Show $\lim s_n$ exists and find $\lim s_n$.

UNIT-II

11

Let $a_n = 3 + 2(-1)^n$ for $n \in \mathbb{N}$.

(a) List the first eight terms of the sequence $(a_n)$.

(b) Give a subsequence that is constant [takes a single value]. Specify the selection function $\sigma$.

12

Consider the sequences defined as follows:

$$a_n = (-1)^n, \qquad b_n = \frac{1}{n}, \qquad c_n = n^2, \qquad d_n = \frac{6n+4}{7n-3}.$$

(a) For each sequence, give an example of a monotone subsequence.

(b) For each sequence, give its set of subsequential limits.

(c) For each sequence, give its lim sup and lim inf.

(d) Which of the sequences converges? diverges to $+\infty$? diverges to $-\infty$?

(e) Which of the sequences is bounded?

13

Prove $\limsup |s_n| = 0$ if and only if $\lim s_n = 0$.

14

Let $(s_n)$ and $(t_n)$ be the following sequences that repeat in cycles of four:

$$(s_n) = (0, 1, 2, 1, 0, 1, 2, 1, 0, 1, 2, 1, 0, 1, 2, 1, 0, \ldots)$$
$$(t_n) = (2, 1, 1, 0, 2, 1, 1, 0, 2, 1, 1, 0, 2, 1, 1, 0, 2, \ldots)$$

Find

(a) $\liminf s_n + \liminf t_n$,

(b) $\liminf(s_n + t_n)$,

(c) $\liminf s_n + \limsup t_n$,

(d) $\limsup(s_n + t_n)$,

(e) $\limsup s_n + \limsup t_n$,

(f) $\liminf(s_n t_n)$,

(g) $\limsup(s_n t_n)$

## 15

Determine which of the following series converge. Justify your answers.

(a) $\sum \frac{n^4}{2^n}$ (b) $\sum \frac{2^n}{n!}$
(c) $\sum \frac{n^2}{3^n}$ (d) $\sum \frac{n!}{n^4+3}$
(e) $\sum \frac{\cos^2 n}{n^2}$ (f) $\sum_{n=2}^{\infty} \frac{1}{\log n}$

## 16

Prove that if $\sum a_n$ is a convergent series of nonnegative numbers and $p > 1$, then $\sum a_n^p$ converges.

## 17

Show that if $\sum a_n$ and $\sum b_n$ are convergent series of nonnegative numbers, then $\sum \sqrt{a_n b_n}$ converges. *Hint*: Show $\sqrt{a_n b_n} \le a_n + b_n$ for all $n$.

## 18

We have seen that it is often a lot harder to find the value of an infinite sum than to show it exists. Here are some sums that can be handled.

(a) Calculate $\sum_{n=1}^{\infty} (\frac{2}{3})^n$ and $\sum_{n=1}^{\infty} (-\frac{2}{3})^n$.

(b) Prove $\sum_{n=1}^{\infty} \frac{1}{n(n+1)} = 1$. *Hint*: Note that $\sum_{k=1}^{n} \frac{1}{k(k+1)} = \sum_{k=1}^{n} [\frac{1}{k} - \frac{1}{k+1}]$.

(c) Prove $\sum_{n=1}^{\infty} \frac{n-1}{2^{n+1}} = \frac{1}{2}$. *Hint*: Note $\frac{k-1}{2^{k+1}} = \frac{k}{2^k} - \frac{k+1}{2^{k+1}}$.

(d) Use (c) to calculate $\sum_{n=1}^{\infty} \frac{n}{2^n}$.

## 19

Determine which of the following series converge. Justify your answers.

(a) $\sum_{n=2}^{\infty} \frac{1}{\sqrt{n}\log n}$ (b) $\sum_{n=2}^{\infty} \frac{\log n}{n}$
(c) $\sum_{n=4}^{\infty} \frac{1}{n(\log n)(\log\log n)}$ (d) $\sum_{n=2}^{\infty} \frac{\log n}{n^2}$

## 20

Show $\sum_{n=2}^{\infty} \frac{1}{n(\log n)^p}$ converges if and only if $p > 1$.

# UNIT-III

## 21

For each of the following power series, find the radius of convergence and determine the exact interval of convergence.

(a) $\sum n^2 x^n$ (b) $\sum (\frac{x}{n})^n$
(c) $\sum (\frac{2^n}{n^2}) x^n$ (d) $\sum (\frac{n^3}{3^n}) x^n$
(e) $\sum (\frac{2^n}{n!}) x^n$ (f) $\sum (\frac{1}{(n+1)^2 2^n}) x^n$
(g) $\sum (\frac{3^n}{n \cdot 4^n}) x^n$ (h) $\sum (\frac{(-1)^n}{n^2 \cdot 4^n}) x^n$

## 22

For $n = 0, 1, 2, 3, \ldots$, let $a_n = [\frac{4+2(-1)^n}{5}]^n$.

(a) Find $\limsup (a_n)^{1/n}$, $\liminf (a_n)^{1/n}$, $\limsup |\frac{a_{n+1}}{a_n}|$ and $\liminf |\frac{a_{n+1}}{a_n}|$.

(b) Do the series $\sum a_n$ and $\sum (-1)^n a_n$ converge? Explain briefly.

## 23

Let $f_n(x) = \frac{1+2\cos^2 nx}{\sqrt{n}}$. Prove carefully that $(f_n)$ converges uniformly to 0 on $\mathbb{R}$.

## 24

Prove that if $f_n \to f$ uniformly on a set $S$, and if $g_n \to g$ uniformly on $S$, then $f_n + g_n \to f + g$ uniformly on $S$.

## 25

Let $f_n(x) = \frac{x^n}{n}$. Show $(f_n)$ is uniformly convergent on $[-1, 1]$ and specify the limit function.

## 26

Let $f_n(x) = \frac{n+\cos x}{2n+\sin^2 x}$ for all real numbers $x$.

(a) Show $(f_n)$ converges uniformly on $\mathbb{R}$. *Hint*: First decide what the limit function is; then show $(f_n)$ converges uniformly to it.

(b) Calculate $\lim_{n\to\infty} \int_2^7 f_n(x)\,dx$. *Hint*: Don't integrate $f_n$.

## 27

Show $\sum_{n=1}^{\infty} \frac{1}{n^2} \cos nx$ converges uniformly on $\mathbb{R}$ to a continuous function.

## 28

Show $\sum_{n=1}^{\infty} \frac{x^n}{n^2 2^n}$ has radius of convergence 2 and the series converges uniformly to a continuous function on $[-2, 2]$.

## 29

(a) Show $\sum \frac{x^n}{1+x^n}$ converges for $x \in [0, 1)$.

(b) Show that the series converges uniformly on $[0, a]$ for each $a$, $0 < a < 1$.

## 30

Suppose $\sum_{k=1}^{\infty} g_k$ and $\sum_{k=1}^{\infty} h_k$ converge uniformly on a set $S$. Show $\sum_{k=1}^{\infty} (g_k + h_k)$ converges uniformly on $S$.

# UNIT-IV

## 31

Let $f(x) = x$ for rational $x$ and $f(x) = 0$ for irrational $x$.

(a) Calculate the upper and lower Darboux integrals for $f$ on the interval $[0, b]$.

(b) Is $f$ integrable on $[0, b]$?

## 32

Let $f$ be a bounded function on $[a, b]$. Suppose there exist sequences $(U_n)$ and $(L_n)$ of upper and lower Darboux sums for $f$ such that $\lim(U_n - L_n) = 0$. Show $f$ is integrable and $\int_a^b f = \lim U_n = \lim L_n$.

## 33

A function $f$ on $[a, b]$ is called a *step function* if there exists a partition $P = \{a = u_0 < u_1 < \cdots < c_m = b\}$ of $[a, b]$ such that $f$ is constant on each interval $(u_{j-1}, u_j)$, say $f(x) = c_j$ for $x$ in $(u_{j-1}, u_j)$.

(a) Show that a step function $f$ is integrable and evaluate $\int_a^b f$.

(b) Evaluate the integral $\int_0^4 P(x)\,dx$ for the postage-stamp function

## 34

Show $\left| \int_{-2\pi}^{2\pi} x^2 \sin^8(e^x)\,dx \right| \le \frac{16\pi^3}{3}$.

## 35

Let $f$ be a bounded function on $[a, b]$, so that there exists $B > 0$ such that $|f(x)| \leq B$ for all $x \in [a, b]$.

**(a)** Show

$$U(f^2, P) - L(f^2, P) \leq 2B[U(f, P) - L(f, P)]$$

for all partitions $P$ of $[a, b]$. *Hint:* $f(x)^2 - f(y)^2 = [f(x) + f(y)] \cdot [f(x) - f(y)]$.

**(b)** Show that if $f$ is integrable on $[a, b]$, then $f^2$ also is integrable on $[a, b]$.

36

Calculate

**(a)** $\lim_{x \to 0} \frac{1}{x} \int_0^x e^{t^2}\, dt$ **(b)** $\lim_{h \to 0} \frac{1}{h} \int_3^{3+h} e^{t^2}\, dt$.

37

Show that if $f$ is a continuous real-valued function on $[a, b]$ satisfying $\int_a^b f(x)g(x)\, dx = 0$ for every continuous function $g$ on $[a, b]$, then $f(x) = 0$ for all $x$ in $[a, b]$.

SEC-2C TRANSPORTATION AND GAME THEORY BS: 401

Credits: 2
Theory: 2 hours /week

Objective: Students learn Transportation problem, assignment problem Games with mixed strategies.
Outcome: Students come to know about nice applications of Operations Research.

Unit I

The Transportation and Assignment Problems : The Transportation Problem - A Streamlined Simplex Method for the Transportation Problem - The Assignment Problem

Unit II

Game Theory: The Formulation of Two-Person, Zero-Sum Games - Solving Simple Games—A Prototype Example - Games with Mixed Strategies - Graphical Solution Procedure - Solving by Linear Programming - Extensions

**Text** : Frederick S Hillier and Gerald J Lieberman, *An Elementary Introduction to Operations Research (9e)*

**References** : Hamdy A Taha , *Operations Research :An introduction*

Gupta and Kapur ; *Operations Research*

SEC-2D NUMBER THEORY BS: 401

Credits: 2
Theory: 2 hours /week

Objective: Students will be exposed to some of the jewels like Fermat's theorem, Euler's theorem in the number theory.
Outcome: Student uses the knowledge acquired solving some divisor problems.

Unit I

The Goldbach conjecture – Basic properties of congruences- Binary and Decimal Representation of Integers – Number Theoretic Functions; The Sum and Number of divisors- The Mobius Inversion Formula- The Greatest integer function

Unit II

Euler's generalization of Fermat's Theorem: Euler's Phi function- Euler's theorem- Some Properties of the Euler's Phi function

**Text:** David M Burton, *Elementary Number Theory (7e)*

**References**: Thomas Koshy, *Elementary Number Theory and its Applications*

Kenneth H Rosen, *Elementary Number Theory*

DSC- 1D ALGEBRA BS: 404

Theory: 4 credits and Practicals: 1 credits
Theory: 4 hours /week and Practicals: 2 hours /week

Objective: The course is aimed at exposing the students to learn some basic algebraic structures like groups, rings etc.

Outcome: On successful completion of the course students will be able to recognize algebraic structures that arise in matrix algebra, linear algebra and will be able to apply the skills learnt in understanding various such subjects.

Unit – I

Groups: Definition and Examples of Groups- Elementary Properties of Groups - Finite Groups; Subgroups -Terminology and Notation -Subgroup Tests - Examples of Subgroups Cyclic Groups: Properties of Cyclic Groups – Classification of Sub groups Cyclic Groups-Permutation Groups: Definition and Notation -Cycle Notation - Properties of Permutations -A Check Digit Scheme Based on $D_5$

Unit – II

Isomorphisms ; Motivation- Definition and Examples -Cayley's Theorem Properties of Isomorphisms -Automorphisms-Cosets and Lagrange's Theorem Properties of Cosets 138 | Lagrange's Theorem and Consequences-An Application of Cosets to Permutation Groups -The Rotation Group of a Cube and a Soccer Ball -Normal Subgroups and Factor Groups ; Normal Subgroups-Factor Groups -Applications of Factor Groups -Group Homomorphisms - Definition and Examples -Properties of Homomorphisms -The First Isomorphism Theorem

Unit – III

Introduction to Rings: Motivation and Definition -Examples of Rings -Properties of Rings -Subrings -Integral Domains : Definition and Examples –Characteristics of a

Ring -Ideals and Factor Rings; Ideals -Factor Rings -Prime Ideals and Maximal Ideals

Unit – IV

Ring Homomorphisms: Definition and Examples-Properties of Ring-Homomorphisms -The Field of Quotients Polynomial Rings: Notation and Terminology

**Text**: Joseph A Gallian, *Contemporary Abstract algebra (9th edition)*

**References:** Bhattacharya, P.B Jain, S.K.; and Nagpaul, S.R, *Basic Abstract Algebra*

Fraleigh, J.B. *A First Course in Abstract Algebra.*

Herstein, I.N. *Topics in Algebra*

Robert B. Ash, *Basic Abstract Algebra*

I Martin Isaacs, *Finite Group Theory*

Joseph J Rotman, *Advanced Modern Algebra*

Practicals Question Bank

ALGEBRA

Unit-I

1. Show that $\{1, 2, 3\}$ under multiplication modulo 4 is not a group but that $\{1, 2, 3, 4\}$ under multiplication modulo 5 is a group.

2. Let G be a group with the property that for any x, y, z in the group, $xy = zx$ implies $y = z$. Prove that G is Abelian.

3. Prove that the set of all $3 \times 3$ matrices with real entries of the form

$$\begin{pmatrix} 1 & a & b \\ 0 & 1 & c \\ 0 & 0 & 1 \end{pmatrix}$$

is a group under multiplication.

4. Let G be the group of polynomials under addition with coefficients from $Z_{10}$. Find the orders of $f(x) = 7x^2 + 5x + 4, g(x) = 4x^2 + 8x + 6$, and $f(x) + g(x)$

5. If $a$ is an element of a group G and $|a| = 7$, show that $a$ is the cube of some element of G.

6. Suppose that $\langle a \rangle$ , $\langle b \rangle$ and $\langle c \rangle$ are cyclic groups of orders 6, 8, and 20, respectively. Find all generators of $\langle a \rangle$ , $\langle b \rangle$ , and $\langle c \rangle$.

7. How many subgroups does $Z_{20}$ have? List a generator for each of these subgroups.

8. Consider the set $\{4, 8, 12, 16\}$. Show that this set is a group under multiplication modulo 20 by constructing its Cayley table. What is the identity element? Is the group cyclic? If so, find all of its generators.

9. Prove that a group of order 4 cannot have a subgroup of order 3.

10. Determine whether the following permutations are even or odd.
    a. (135)
    b. (1356)
    c. (13567)
    d. (12)(134)(152)
    e. (1243)(3521).

Unit-II

1. Show that the mapping $a \longrightarrow \log_{10} a$ is an isomorphism from $R^+$ under multiplication to $R$ under addition.

2. Show that the mapping $f(a + bi) = a - bi$ is an automorphism of the group of complex numbers under addition.

3. Find all of the left cosets of $\{1, 11\}$ in $U(30)$.

4. Let $C^*$ be the group of nonzero complex numbers under multiplication and let $H = \{a + bi \in C^*/a^2 + b^2 = 1\}$. Give a geometric description of the coset $(3 + 4i)H$. Give a geometric description of the coset $(c + di)H$.

5. Let $H = \left\{ \begin{pmatrix} a & b \\ 0 & d \end{pmatrix} /a, b, d \in R, ad \neq 0 \right\}$. Is $H$ a normal subgroup of $GL(2, R)$?

6. What is the order of the factor group $\frac{Z_{60}}{\langle 5 \rangle}$?

7. Let $G = U(16), H = \{1, 15\}$, and $K = \{1, 9\}$. Are $H$ and $K$ isomorphic? Are $G/H$ and $G/K$ isomorphic?

8. Prove that the mapping from $R$ under addition to $GL(2, R)$ that takes $x$ to

$$\begin{bmatrix} cosx & sinx \\ -sinx & cosx \end{bmatrix}$$

is a group homomorphism. What is the kernel of the homomorphism?

9. Suppose that f is a homomorphism from $Z30$ to $Z30$ and $Kerf = \{0, 10, 20\}$. If $f(23) = 9$, determine all elements that map to 9.

10. How many Abelian groups (up to isomorphism) are there
a. of order 6?
b. of order 15?
c. of order 42?
d. of order $pq$, where $p$ and $q$ are distinct primes?
e. of order $pqr$, where $p$, $q$, and $r$ are distinct primes?

Unit-III

1. Let $M_2(Z)$ be the ring of all $2 \times 2$ matrices over the integers and let $R = \left\{ \begin{pmatrix} a & a \\ b & b \end{pmatrix} /a, b \in Z \right\}$ Prove or disprove that R is a subring of $M_2(Z)$.

2. Suppose that $a$ and $b$ belong to a commutative ring $R$ with unity. If $a$ is a unit of $R$ and $b^2 = 0$, show that $a + b$ is a unit of $R$.

3. Let $n$ be an integer greater than 1. In a ring in which $x^n = x$ for all $x$, show that $ab = 0$ implies $ba = 0$.

4. List all zero-divisors in $Z_{20}$. Can you see a relationship between the zero-divisors of $Z_{20}$ and the units of $Z_{20}$?

5. Let $a$ belong to a ring $R$ with unity and suppose that $a^n = 0$ for some positive integer $n$. (Such an element is called nilpotent.) Prove that $1 - a$ has a multiplicative inverse in $R$.

6. Let $d$ be an integer. Prove that $Z[\sqrt{d}] = \{a + b\sqrt{d}/a, b \in Z\}$ is an integral domain.

7. Show that $Z_n$ has a nonzero nilpotent element if and only if $n$ is divisible by the square of some prime.

8. Find all units, zero-divisors, idempotents, and nilpotent elements in $Z_3 \bigoplus Z_6$.

9. Find all maximal ideals in
   a. $Z_8$.
   b. $Z_{10}$.
   c. $Z_{12}$.
   d. $Z_n$.

10. Show that $R[x]/\langle x^2+1\rangle$ is a field.

Unit-IV

1. Prove that every ring homomorphism $f$ from $Z_n$ to itself has the form $f(x) = ax$, where $a^2 = a$.

2. Prove that a ring homomorphism carries an idempotent to an idempotent.

3. In $Z$, let $A = \langle 2\rangle$ and $B = \langle 8\rangle$. Show that the group $A/B$ is isomorphic to the group $Z_4$ but that the ring $A/B$ is not ring-isomorphic to the ring $Z_4$.

4. Show that the number $9,897,654,527,609,805$ is divisible by 99.

5. Show that no integer of the form $111,111,111,...,111$ is prime.

6. Let $f(x) = 4x^3+2x^2+x+3$ and $g(x) = 3x^4+3x^3+3x^2+x+4$, where $f(x), g(x) \in Z_5[x]$. Compute $f(x)+g(x)$ and $f(x).g(x)$.

7. Let $f(x) = 5x^4+3x^3+1$ and $g(x) = 3x^2+2x+1$ in $Z_7[x]$.Determine the quotient and remainder upon dividing $f(x)$ by $g(x)$.

8. Let $f(x)$ belong to $Z_p[x]$. Prove that if $f(b) = 0$, then $f(b^p) = 0$.

9. Determine which of the polynomials below is (are) irreducible over Q.
   a. $x^5+9x^4+12x^2+6$
   b. $x^4+x+1$
   c. $x^4+3x^2+3$
   d. $x^5+5x^2+1$
   e. $(5/2)x^5+(9/2)x^4+15x^3+(3/7)x^2+6x+3/14$.

10. Show that $x^2+x+4$ is irreducible over $Z_{11}$.

SEC-3E PROBABITY AND STATISTICS BS: 501

Credits: 2
Theory: 2 hours /week

Objective: Students are exposed some basic ideas like random variables and its related concepts.
Outcome: Students will be able to their knowledge to solve some real world problems.

Unit I

Random Variables; Continuous Random Variables - Expectation of a Random Variable - Jointly Distributed Random Variables - Moment Generating Functions

Unit II

Conditional Probability and Conditional Expectation Introduction ; The Discrete Case -The Continuous Case - Computing Expectations by Conditioning - Computing Variances by Conditioning - Computing Probabilities by Conditioning

**Text:** Sheldon M Ross, *Introduction to Probability Models (9e)*

**References:** Miller and Miller, *Mathematical Statistics with Applications*

Hogg, McKeanand Craig, *Introduction to Mathematical Statistics*

Gupta and Kapur, *Mathematical Statistics*

SEC -3F MATHEMATICAL MODELING BS: 501

Credits: 2

Theory: 2 hours /week

Objective: Some of the Physics problems will be solved using Differential Equations.

Outcome: Student realizes some beautiful problems can be modeled by using differential equations.

Unit I

Linear Models-Nonlinear Models-Modeling with Systems of First-Order DEs-

Unit II

Linear Models: Initial-Value Problems-Spring/Mass Systems: Free Undamped Motion-Spring/Mass Systems: Free Damped Motion-Spring/Mass Systems: Driven Motion-Series Circuit Analogue-Linear Models: Boundary-Value Problems

**Text**: Dennis G Zill, *A first course in differential equations with modeling applications*

**References**: Shepley L. Ross, *Differential Equations*

I. Sneddon, *Elements of Partial Differential Equations*

GE-I | LATTICE THEORY | BS: 502

Credits: 2
Theory: 2 hours /week

Objective: Students will be exposed to elements of theory of lattices.

Outcome : Students apply their knowledge to solve some problems on switching circuits.

Unit I

Lattices: Properties and Examples of Lattices - Distributive Lattices – Boolean Algebras - Boolean Polynomials - Ideals, Filters, and Equations - Minimal Forms of Boolean Polynomials

Unit II

Applications of Lattices – Switching Circuits - Applications of Switching Circuits . - More Applications of Boolean Algebras

**Text :** Rudolf Lidl and Gunter Pilz, *Applied Abstract Algebra (2e)*

**References:** Davey and Priestly, *Introduction to Lattices and Order*

DSC-1E LINEAR ALGEBRA BS: 503

Theory: 3 credits and Practicals: 1 credits
Theory: 3 hours /week and Practicals: 2 hours /week

Objective: The students are exposed to various concepts like vector spaces , bases , dimension, Eigen values etc .

Outcome: After completion this course students appreciate its interdisciplinary nature.

Unit I

Vector Spaces : Vector Spaces and Subspaces -Null Spaces, Column Spaces, and Linear Transformations -Linearly Independent Sets; Bases -Coordinate Systems -The Dimension of a Vector Space

Unit II

Rank-Change of Basis - Eigenvalues and Eigenvectors - The Characteristic Equation

Unit III

Diagonalization -Eigenvectors and Linear Transformations -Complex Eigenvalues - Applications to Differential Equations -Orthogonality and Least Squares : Inner Product, Length, and Orthogonality -Orthogonal Sets

**Text** : David C Lay , *Linear Algebra and its Applications 4e*

**References:** S Lang, *Introduction to Linear Algebra*

Gilbert Strang, Linear *Algebra and its Applications*

Stephen H Friedberg et al, *Linear Algebra*

Kuldeep Singh, *Linear Algebra*

Sheldon Axler, *Linear Algebra Done Right*

# **Linear Algebra**
## Practicals Question Bank

UNIT-I

1

Let $H$ be the set of all vectors of the form $\begin{bmatrix} -2t \\ 5t \\ 3t \end{bmatrix}$. Find a vector $\mathbf{v}$ in $\mathbb{R}^3$ such that $H = \text{Span}\{\mathbf{v}\}$. Why does this show that $H$ is a subspace of $\mathbb{R}^3$?

2

Let $V$ be the first quadrant in the $xy$-plane; that is, let

$$V = \left\{ \begin{bmatrix} x \\ y \end{bmatrix} : x \geq 0, y \geq 0 \right\}$$

a. If $\mathbf{u}$ and $\mathbf{v}$ are in $V$, is $\mathbf{u} + \mathbf{v}$ in $V$? Why?

b. Find a specific vector $\mathbf{u}$ in $V$ and a specific scalar $c$ such

3

Let $\mathbf{v}_1 = \begin{bmatrix} 1 \\ -2 \\ 3 \end{bmatrix}$ and $\mathbf{v}_2 = \begin{bmatrix} -2 \\ 7 \\ -9 \end{bmatrix}$. Determine if $\{\mathbf{v}_1, \mathbf{v}_2\}$ is a basis for $\mathbb{R}^3$. Is $\{\mathbf{v}_1, \mathbf{v}_2\}$ a basis for $\mathbb{R}^2$?

4

The set $\mathcal{B} = \{1 + t^2, t + t^2, 1 + 2t + t^2\}$ is a basis for $\mathbb{P}_2$. Find the coordinate vector of $\mathbf{p}(t) = 1 + 4t + 7t^2$ relative to $\mathcal{B}$.

5

The set $\mathcal{B} = \{1 - t^2, t - t^2, 2 - t + t^2\}$ is a basis for $\mathbb{P}_2$. Find the coordinate vector of $\mathbf{p}(t) = 1 + 3t - 6t^2$ relative to $\mathcal{B}$.

6

The vectors $\mathbf{v}_1 = \begin{bmatrix} 1 \\ -3 \end{bmatrix}, \mathbf{v}_2 = \begin{bmatrix} 2 \\ -8 \end{bmatrix}, \mathbf{v}_3 = \begin{bmatrix} -3 \\ 7 \end{bmatrix}$ span $\mathbb{R}^2$ but do not form a basis. Find two different ways to express $\begin{bmatrix} 1 \\ 1 \end{bmatrix}$ as a linear combination of $\mathbf{v}_1, \mathbf{v}_2, \mathbf{v}_3$.

7

Find the dimension of the subspace of all vectors in $\mathbb{R}^3$ whose first and third entries are equal.

8

Find the dimension of the subspace $H$ of $\mathbb{R}^2$ spanned by $\begin{bmatrix} 1 \\ -5 \end{bmatrix}, \begin{bmatrix} -2 \\ 10 \end{bmatrix}, \begin{bmatrix} -3 \\ 15 \end{bmatrix}$.

9

Let $H$ be an $n$-dimensional subspace of an $n$-dimensional vector space $V$. Show that $H = V$.

10

Let $H$ be an $n$-dimensional subspace of an $n$-dimensional vector space $V$. Show that $H = V$.

## UNIT-II

### 11

If a $4 \times 7$ matrix $A$ has rank 3, find dim Nul $A$, dim Row $A$, and rank $A^T$.

### 12

If a $7 \times 5$ matrix $A$ has rank 2, find dim Nul $A$, dim Row $A$, and rank $A^T$.

### 13

If the null space of an $8 \times 5$ matrix $A$ is 3-dimensional, what is the dimension of the row space of $A$?

### 14

If $A$ is a $3 \times 7$ matrix, what is the smallest possible dimension of Nul $A$?

### 15

Let $\mathbf{u} = \begin{bmatrix} 1 \\ 2 \end{bmatrix}$. Find $\mathbf{v}$ in $\mathbb{R}^3$ such that $\begin{bmatrix} 1 & -3 & 4 \\ 2 & -6 & 8 \end{bmatrix} = \mathbf{u}\mathbf{v}^T$.

### 16

If $A$ is a $7 \times 5$ matrix, what is the largest possible rank of $A$? If $A$ is a $5 \times 7$ matrix, what is the largest possible rank of $A$? Explain your answers.

### 17

Without calculations, list rank $A$ and dim Nul $A$

$$A = \begin{bmatrix} 2 & 6 & -6 & 6 & 3 & 6 \\ -2 & -3 & 6 & -3 & 0 & -6 \\ 4 & 9 & -12 & 9 & 3 & 12 \\ -2 & 3 & 6 & 3 & 3 & -6 \end{bmatrix}.$$

### 18

Use a property of determinants to show that $A$ and $A^T$ have the same characteristic polynomial.

### 19

Find the characteristic equation of

$$A = \begin{bmatrix} 5 & -2 & 6 & -1 \\ 0 & 3 & -8 & 0 \\ 0 & 0 & 5 & 4 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

### 20

Find the characteristic polynomial and the real eigenvalues of

$$\begin{bmatrix} 4 & 0 & -1 \\ 0 & 4 & -1 \\ 1 & 0 & 2 \end{bmatrix}, \begin{bmatrix} -1 & 0 & 2 \\ 3 & 1 & 0 \\ 0 & 1 & 2 \end{bmatrix}$$

## UNIT-III

### 21

let $A = PDP^{-1}$ and compute $A^4$

$\begin{bmatrix} 5 & 7 \\ 2 & 3 \end{bmatrix}, \begin{bmatrix} 1 & 2 \\ 2 & 3 \end{bmatrix}$

### 22

Let $\mathcal{B} = \{\mathbf{b}_1, \mathbf{b}_2, \mathbf{b}_3\}$ and $\mathcal{D} = \{\mathbf{d}_1, \mathbf{d}_2\}$ be bases for vector spaces $V$ and $W$, respectively. Let $T : V \to W$ be a linear transformation with the property that

$$T(\mathbf{b}_1) = 3\mathbf{d}_1 - 5\mathbf{d}_2, \quad T(\mathbf{b}_2) = -\mathbf{d}_1 + 6\mathbf{d}_2, \quad T(\mathbf{b}_3) = 4\mathbf{d}_2$$

Find the matrix for $T$ relative to $\mathcal{B}$ and $\mathcal{D}$.

### 23

Let $\mathcal{D} = \{\mathbf{d}_1, \mathbf{d}_2\}$ and $\mathcal{B} = \{\mathbf{b}_1, \mathbf{b}_2\}$ be bases for vector spaces $V$ and $W$, respectively. Let $T : V \to W$ be a linear transformation with the property that

$$T(\mathbf{d}_1) = 3\mathbf{b}_1 - 3\mathbf{b}_2, \quad T(\mathbf{d}_2) = -2\mathbf{b}_1 + 5\mathbf{b}_2$$

Find the matrix for $T$ relative to $\mathcal{D}$ and $\mathcal{B}$.

### 24

Let $\mathcal{B} = \{\mathbf{b}_1, \mathbf{b}_2, \mathbf{b}_3\}$ be a basis for a vector space $V$ and let $T : V \to \mathbb{R}^2$ be a linear transformation with the property that

$$T(x_1\mathbf{b}_1 + x_2\mathbf{b}_2 + x_3\mathbf{b}_3) = \begin{bmatrix} 2x_1 - 3x_2 + x_3 \\ -2x_1 + 5x_3 \end{bmatrix}$$

Find the matrix for $T$ relative to $\mathcal{B}$ and the standard basis for $\mathbb{R}^2$.

### 25

Let $T : \mathbb{P}_2 \to \mathbb{P}_3$ be the transformation that maps a polynomial $\mathbf{p}(t)$ into the polynomial $(t + 3)\mathbf{p}(t)$.

a. Find the image of $\mathbf{p}(t) = 3 - 2t + t^2$.

b. Show that $T$ is a linear transformation.

c. Find the matrix for $T$ relative to the bases $\{1, t, t^2\}$ and $\{1, t, t^2, t^3\}$.

### 26

Assume the mapping $T : \mathbb{P}_2 \to \mathbb{P}_2$ defined by

$$T(a_0 + a_1t + a_2t^2) = 3a_0 + (5a_0 - 2a_1)t + (4a_1 + a_2)t^2$$

is linear. Find the matrix representation of $T$ relative to the basis $\mathcal{B} = \{1, t, t^2\}$.

### 27

Define $T : \mathbb{P}_3 \to \mathbb{R}^4$ by $T(\mathbf{p}) = \begin{bmatrix} \mathbf{p}(-2) \\ \mathbf{p}(3) \\ \mathbf{p}(1) \\ \mathbf{p}(0) \end{bmatrix}$.

a. Show that $T$ is a linear transformation.

b. Find the matrix for $T$ relative to the basis $\{1, t, t^2, t^3\}$ for $\mathbb{P}_3$ and the standard basis for $\mathbb{R}^4$.

## 28

Let $A$ be a $2 \times 2$ matrix with eigenvalues $-3$ and $-1$ and corresponding eigenvectors $\mathbf{v}_1 = \begin{bmatrix} -1 \\ 1 \end{bmatrix}$ and $\mathbf{v}_2 = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$. Let $\mathbf{x}(t)$ be the position of a particle at time $t$. Solve the initial value problem $\mathbf{x}' = A\mathbf{x}$, $\mathbf{x}(0) = \begin{bmatrix} 2 \\ 3 \end{bmatrix}$.

## 29

construct the general solution of $\mathbf{x}' = A\mathbf{x}$

$A = \begin{bmatrix} -3 & 2 \\ -1 & -1 \end{bmatrix}$ , $\begin{bmatrix} -7 & 10 \\ -4 & 5 \end{bmatrix}$

## 30

Compute the orthogonal projection of $\begin{bmatrix} 1 \\ 7 \end{bmatrix}$ onto the line through $\begin{bmatrix} -4 \\ 2 \end{bmatrix}$ and the origin.

DSE-1E/A ANALYTICAL SOLID GEOMETRY BS: 506

Theory: 3 credits and Practicals: 1 credits
Theory: 3 hours /week and Practicals: 2 hours /week

Objective: Students learn to describe some of the surfaces by using analytical geometry.

Outcome: Students understand the beautiful interplay between algebra and geometry.

Unit I

Sphere: Definition-The Sphere Through Four Given Points-Equations of a Circle-Intersection of a Sphere and a Line-Equation of a Tangent Plane-Angle of Intersection of Two Spheres-Radical Plane

Unit II

Cones and Cylinders: Definition-Condition that the General Equation of second degree Represents a Cone-Cone and a Plane through its Vertex –Intersection of a Line with a Cone- The Right Circular Cone-The Cylinder- The Right Circular Cylinder

Unit III

The Conicoid: The General Equation of the Second Degree-Intersection of Line with a Conicoid-Plane of contact-Enveloping Cone and Cylinder

**Text** : Shanti Narayan and P K Mittal , *Analytical Solid Geometry (17e)*

**References:** Khaleel Ahmed , *Analytical Solid Geometry*

S L Loney, *Solid Geometry*

Smith and Minton, *Calculus*

# Solid Geometry

## Practicals Question Bank

### UNIT-I

1

Find the equation of the sphere through the four points

$$(4, -1, 2), (0, -2, 3), (1, -5, -1), (2, 0, 1).$$

2

Find the equation of the sphere through the four points

$$(0, 0, 0), (-a, b, c), (a, -b, c), (a, b, -c)$$

3

Find the centre and the radius of the circle

$$x+2y+2z=15,\ x^2+y^2+z^2-2y-4z=11.$$

4

Show that the following points are concyclic :—

(*i*) $(5, 0, 2), (2, -6, 0), (7, -3, 8), (4, -9, 6)$.

(*ii*) $(-8, 5, 2), (-5, 2, 2), (-7, 6, 6), (-4, 3, 6)$.

5

Find the centres of the two spheres which touch the plane

$$4x+3y=47$$

at the point $(8, 5, 4)$ and which touch the sphere

$$x^2+y^2+z^2=1.$$

6

Show that the spheres

$$x^2+y^2+z^2=25$$

$$x^2+y^2+z^2-24x-40y-18z+225=0$$

touch externally and find the point of the contact.

7

Find the equation of the sphere that passes through the two points

$$(0, 3, 0), (-2, -1, -4)$$

and cuts orthogonally the two spheres

$$x^2+y^2+z^2+x-3z-2=0,\ 2(x^2+y^2+z^2)+x+3y+4=0.$$

8

Find the limiting points of the co-axal system of spheres

$$x^2+y^2+z^2-20x+30y-40z+29+\lambda(2x-3y+4z)=0.$$

9

Find the equations to the two spheres of the co-axal system

$$x^2+y^2+z^2-5+\lambda(2x+y+3z-3)=0,$$

which touch the plane

$$3x+4y=15.$$

10

Show that the radical planes of the sphere of a co-axal system and of any given sphere pass through a line.

### UNIT-II

11

Find the equation of the cone whose vertex is the point $(1, 1, 0)$ and whose guiding curve is

$$y=0,\ x^2+z^2=4.$$

12

The section of a cone whose vertex is $P$ and guiding curve the ellipse $x^2/a^2+y^2/b^2=1$, $z=0$ by the plane $x=0$ is a rectangular hyperbola. Show that the locus of $P$ is

$$\frac{x^2}{a^2}+\frac{y^2+z^2}{b^2}=1.$$

13

Find the enveloping cone of the sphere

$$x^2+y^2+z^2-2x+4z=1$$

with its vertex at $(1, 1, 1)$.

14

*Find the equation of the quadric cone whose vertex is at the origin and which passes through the curve given by the equations*

$$ax^2+by^2+cz^2=1,\ lx+my+nz=p.$$

15

Find the equation of the cone with vertex at the origin and direction cosines of its generators satisfying the relation

$$3l^2-4m^2+5n^2=0.$$

16

Find the equation of the cylinder whose generators are parallel to

$$x=-\tfrac{1}{2}y=\tfrac{1}{3}z$$

and whose guiding curve is the ellipse

$$x^2+2y^2=1,\ z=3.$$

17

Find the equation of the right circular cylinder of radius 2 whose axis is the line

$$(x-1)/2=(y-2)=(z-3)/2.$$

18

The axis of a right circular cylinder of radius 2 is

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

show that its equation is

$$10x^2+5y^2+13z^2-12xy-6yz-4zx-8x+30y-74z+59=0.$$

19

Find the equation of the circular cylinder whose guiding circle is

$$x^2+y^2+z^2-9=0,\ x-y+z=3.$$

20

Obtain the equation of the right circular cylinder described on the circle through the three points (1, 0, 0), (0, 1, 0), (0, 0, 1) as guiding circle.

UNIT-III

21

Find the points of intersection of the line

$$-\tfrac{1}{3}(x+5)=(y-4)=\tfrac{1}{7}(z-11)$$

with the conicoid

$$12x^2-17y^2+7z^2=7.$$

22

*Find the equations to the tangent planes to*

$$7x^2-3y^2-z^2+21=0,$$

*which pass through the line,*

$$7x-6y+9=3,\ z=3.$$

23

*Obtain the tangent planes to the ellipsoid*

$$x^2/a^2+y^2/b^2+z^2/c^2=1,$$

*which are parallel to the plane*

$$lx+my+nz=0.$$

24

Show that the plane $3x+12y-6z-17=0$ touches the conicoid $3x^2-6y^2+9z^2+17=0$, and find the point of contact.

25

Find the equations to the tangent planes to the surface

$$4x^2-5y^2+7z^2+13=0,$$

26

Find the equations to the tangent planes to the surface

$$4x^2-5y^2+7z^2+13=0,$$

parallel to the plane

$$4x+20y-21z=0.$$

Find their points of contact also.

27

Find the locus of the perpendiculars from the origin to the tangent planes to the surface

$$x^2/a^2+y^2/b^2+z^2/c^2=1$$

which cut off from its axes intercepts the sum of whose reciprocals is equal to a constant $1/k$.

28

If the section of the enveloping cone of the ellipsoid

$$x^2/a^2+y^2/b^2+z^2/c^2=1,$$

whose vertex is $P$ by the plane $z=0$ is a rectangular hyperbola, show that the locus of $P$ is

$$\frac{x^2+y^2}{a^2+b^2}+\frac{z^2}{c^2}=1.$$

29

Find the locus of points from which three mutually perpendicular tangent lines can be drawn to the conicoid $ax^2+by^2+cz^2=1$.

30

$P(1, 3, 2)$ is a point on the conicoid,

$$x^2-2y^2+3z^2+5=0.$$

Find the locus of the mid-points of chords drawn parallel to $OP$.

DSE-1E/B INTEGRAL CALCULUS BS: 506

Theory: 3 credits and Practicals: 1 credits
Theory: 3 hours /week and Practicals: 2 hours /week

Objective: Techniques of multiple integrals will be taught.

Outcome: Students will come to know about its applications in finding areas and volumes of some solids.

Unit I

Areas and Volumes: Double Integrals-Double Integrals over a Rectangle-Double Integrals over General Regions in the Plane-Changing the order of Integration

Unit II

Triple Integrals: The Integrals over a Box- Elementary Regions in Space-Triple Integrals in General

Unit III

Change of Variables: Coordinate Transformations-Change of Variables in Triple Integrals

**Text:** Susan Jane Colley, *Vector Calculus(4e)*

**References:** Smith and Minton , *Calculus*

Shanti Narayan and Mittal, *Integral calculus*

Ulrich L. Rohde , G. C. Jain , Ajay K. Poddar and A. K. Ghosh, *Introduction to Integral Calculus*

# Integral Calculus

## Practicals Question Bank

### Unit-I

1. Let $R = [-3, 3] \times [-2, 2]$. Without explicitly evaluating any iterated integrals, determine the value of $\iint_R (x^5 + 2y)\,dA$.

2. Integrate the function $f(x, y) = 3xy$ over the region bounded by $y = 32x^3$ and $y = \sqrt{x}$.

3. Integrate the function $f(x, y) = x + y$ over the region bounded by $x + y = 2$ and $y^2 - 2y - x = 0$.

4. Evaluate $\iint_D xy\,dA$, where $D$ is the region bounded by $x = y^2$ and $x = y$.

5. Evaluate $\iint_D e^{x^2}\,dA$, where $D$ is the triangular region with vertices $(0, 0)$, $(1, 0)$, and $(1, 1)$.

6. Evaluate $\iint_D 3y\,dA$, where $D$ is the region bounded by $xy^2 = 1$, $y = x$, $x = 0$, and $y = 3$.

7. Evaluate $\iint_D (x - 2y)\,dA$, where $D$ is the region bounded by $y = x^2 - 2$ and $y = 2x - 2$.

8. Evaluate $\iint_D (x^2 + y^2)\,dA$, where $D$ is the region in the first quadrant bounded by $y = x$, $y = 3x$, and $xy = 3$.

9. Consider the integral

$$\int_0^2 \int_{x^2}^{2x} (2x + 1)\,dy\,dx.$$

(a) Evaluate this integral.

(b) Sketch the region of integration.

(c) Write an equivalent iterated integral with the order of integration reversed. Evaluate this new integral and check that your answer agrees with part (a).

10. Find the volume of the region under the graph of

$$f(x, y) = 2 - |x| - |y|$$

and above the $xy$-plane.

## Unit-II

Integrate the following over the indicated region W.

$f(x, y, z) =$ [illegible] $z$; $W$ is the region bounded by the cylinder [illegible], the $xy$-plane, and the planes [illegible] $0$, [illegible] $2$, $y = 2$.

$f(x, y, z) =$ [illegible]; $W$ is the region bounded by the plane [illegible] $= 2$, the cylinder [illegible], and [illegible] $= 0$

$f(x, y, z) =$ [illegible]; $W$ is the region bounded by the cylinder [illegible], the plane [illegible], and the [illegible] plane.

$f(x, y, z) =$ [illegible]; $W$ is the region in the first octant bounded by the cylinder [illegible] and the planes [illegible] $= 0$, and [illegible] $= 0$

$f(x, y, z) =$ [illegible]; $W$ is the tetrahedron with vertices $(0, 0, 0)$, $(1, 0, 0)$, $(0, 2, 0)$, and $(0, 0, 3)$.

$f(x, y, z) =$ [illegible]; $W$ is the region in the first octant bounded by [illegible] $y^2$, [illegible] $= 0$, [illegible] $= 0$, and [illegible] $4$.

$f(x, y, z) =$ [illegible]; $W$ is the region bounded by the cylinder [illegible] and the planes [illegible] $0$, [illegible] $3$.

$f(x, y, z) =$ [illegible]; $W$ is the region bounded by [illegible] $0$, [illegible] $4$ [illegible], and [illegible] $x - 2$.

## Unit-III

$f(x, y, z) =$ [illegible]; $W$ is the region bounded by [illegible], and $z = 0$.

$f(x, y, z) =$ [illegible]; $W$ is the region in the first octant bounded by [illegible] $2y^2$, $z = 6 -$ [illegible], [illegible] $0$, and $y = 0$.

Let $T(u, v) =$ [illegible].

(a) Write $T(u, v)$ as $A \begin{bmatrix} u \\ v \end{bmatrix}$ for a suitable matrix $A$.

(b) Describe the image $D = T(D^*)$, where $D^*$ is the unit square $[0, 1] \times [0, 1]$.

Determine the value of

$$\iint_D \sqrt{\frac{x + y}{x - 2y}}\, dA,$$

where $D$ is the region in $\mathbf{R}^2$ enclosed by the lines

24. Evaluate

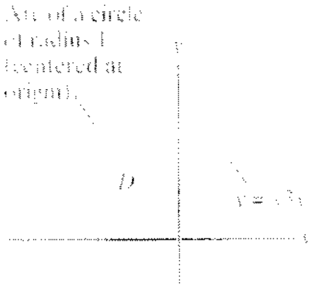
$$\iint_D \frac{(2x+y-3)^2}{(2y-x+6)^2}\,dx\,dy,$$

where $D$ is the square with vertices $(0,0)$, $(2,1)$, $(3,-1)$, and $(1,-2)$. (Hint: First sketch $D$ and find the equations of its sides.)

25. Evaluate

$$\iint_D \cos(x^2+y^2)\,dA,$$

where $D$ is the shaded region in Figure 5.106.




The region $D$ of
Exercise 25.

26. Evaluate

$$\iint_D \frac{1}{\sqrt{4-x^2-y^2}}\,dA,$$

where $D$ is the disk of radius 1 with center at $(0,1)$. (Be careful when you describe $D$.)

27. Determine the value of $\iiint_W \frac{z}{\sqrt{x^2+y^2}}\,dV$, where $W$ is the solid region bounded by the plane $z = 12$ and the paraboloid $z = 2x^2+2y^2-6$.

SEC-4G BOOLEAN ALGEBRA BS: 601

Credits: 2
Theory: 2 hours /week

Objective: Students will be exposed to Elements of theory of lattices.

Outcome : Students apply their Knowledge in solving some problems on switching circuits.

Unit I

Lattices: Properties and Examples of Lattices - Distributive Lattices – Boolean Algebras - Boolean Polynomials - Ideals, Filters, and Equations - Minimal Forms of Boolean Polynomials

Unit II

Applications of Lattices – Switching Circuits - Applications of Switching Circuits . - More Applications of Boolean Algebras

**Text :** Rudolf Lidl and Gunter Pilz, *Applied Abstract Algebra (2e)*

**References:** Davey and Priestly, *Introduction to Lattices and Order*

SEC-4H GRAPH THEORY BS: 601

Credits: 2
Theory: 2 hours /week

Objective: The students will be exposed To some basic ideas of group theory.

Outcome: Students will be able to appreciate the subject learnt.

Unit I

Graphs: A Gentle Introduction - Definitions and Basic Properties - Isomorphism

Unit II

Paths and Circuits: Eulerian Circuits - Hamiltonian Cycles -The Adjacency Matrix Shortest Path Algorithms

**Text** : Edgar Goodaire and Michael M. Parmenter, *Discrete Mathematics with Graph Theory (2e)*

**References:** Rudolf Lidl and Gunter Pilz, *Applied Abstract Algebra*

S Pirzada, *Introduction to Graph Theory*

GE-2 ELEMENTS OF NUMBER THEORY BS:602

Credits: 2
Theory: 2 hours /week

Objective: Students will be exposed to some elements of number theory.

Outcome : Students apply their knowledge problems on check digits, modular designs.

Unit I

The Division Algorithm- Number Patterns- Prime and Composite Numbers- Fibonacci and Lucas' numbers- Fermat Numbers- GCD-The Euclidean Algorithm- The Fundamental Theorem of Arithmetic- LCM- Linear Diophantine Equations Congruences- Linear Congruences

Unit II

The Pollard Rho Factoring Method- Divisibility Tests- Modular Designs- Check Digits- The Chinese Remainder Theorem- General Linear Systems- 2X2 Systems Wilson's Theorem- Fermat's Little Theorem- Pseudo primes- Euler's Theorem

**Text :** Thomas Koshy, *Elementary Number Theory with Applications*

**References:** David M Burton, *Elementary Number Theory*

DSC-1F | NUMERICAL ANALYSIS | BS: 603

# NUMERICAL ANALYSIS

Theory: 3 credits and Practicals: 1 credits
Theory: 3 hours /week and Practicals: 2 hours /week

Objective: Students will be made to understand some methods of numerical analysis.

Outcome: Students realize the importance of the subject in solving some problems of algebra and calculus.

Unit – I

Solutions of Equations in One Variable : The Bisection Method - Fixed-Point Iteration - Newton's Method and Its Extensions - Error Analysis for Iterative Methods - Accelerating Convergence - Zeros of Polynomials and Müller's Method - Survey of Methods and Software

Unit – II

Interpolation and Polynomial Approximation: Interpolation and the Lagrange Polynomial - Data Approximation and Neville's Method - Divided Differences - Hermite Interpolation - Cubic Spline Interpolation

Unit – III

Numerical Differentiation and Integration: Numerical Differentiation - Richardson's Extrapolation - Elements of Numerical Integration- Composite Numerical Integration - Romberg Integration - Adaptive Quadrature Methods - Gaussian Quadrature

**Text :** Richard L. Burden and J. Douglas Faires, *Numerical Analysis (9e)*

**References:** M K Jain, S R K Iyengar and R k Jain, *Numerical Methods for Scientific and Engineering computation*

B.Bradie, *A Friendly introduction to Numerical Analysis*

# Numerical Analysis

## Practicals Question Bank

### UNIT-I

1

Use the Bisection method to find $p_3$ for $f(x) = \sqrt{x} - \cos x$ on $[0, 1]$.

2

Let $f(x) = 3(x+1)(x-\frac{1}{2})(x-1)$. Use the Bisection method on the following intervals to find $p_3$.

**a.** $[-2, 1.5]$ **b.** $[-1.25, 2.5]$

3

Use the Bisection method to find solutions accurate to within $10^{-5}$ for the following problems.

**a.** $x - 2^{-x} = 0$ for $0 \le x \le 1$

**b.** $e^x - x^2 + 3x - 2 = 0$ for $0 \le x \le 1$

**c.** $2x\cos(2x) - (x+1)^2 = 0$ for $-3 \le x \le -2$ and $-1 \le x \le 0$

4

**1.** Use algebraic manipulation to show that each of the following functions has a fixed point at $p$ precisely when $f(p) = 0$, where $f(x) = x^4 + 2x^2 - x - 3$.

**a.** $g_1(x) = \left(3 + x - 2x^2\right)^{1/4}$ **b.** $g_2(x) = \left(\dfrac{x + 3 - x^4}{2}\right)^{1/2}$

5

Use a fixed-point iteration method to determine a solution accurate to within $10^{-2}$ for $x^4 - 3x^2 - 3 = 0$ on $[1, 2]$. Use $p_0 = 1$.

6

Use a fixed-point iteration method to determine a solution accurate to within $10^{-2}$ for $x^3 - x - 1 = 0$ on $[1, 2]$. Use $p_0 = 1$.

7

Use a fixed-point iteration method to find an approximation to $\sqrt{3}$ that is accurate to within $10^{-4}$.

8

The equation $x^2 - 10\cos x = 0$ has two solutions, $\pm 1.3793646$. Use Newton's method to approximate the solutions to within $10^{-5}$ with the following values of $p_0$.

**a.** $p_0 = -100$ **b.** $p_0 = -50$ **c.** $p_0 = -25$

**d.** $p_0 = 25$ **e.** $p_0 = 50$ **f.** $p_0 = 100$

9

The equation $4x^2 - e^x - e^{-x} = 0$ has two positive solutions $x_1$ and $x_2$. Use Newton's method to approximate the solution to within $10^{-5}$ with the following values of $p_0$.

10

Use each of the following methods to find a solution in $[0.1, 1]$ accurate to within $10^{-4}$ for

$$600x^4 - 550x^3 + 200x^2 - 20x - 1 = 0.$$

**a.** Bisection method **c.** Secant method **e.** Müller's method

**b.** Newton's method **d.** method of False Position

## UNIT-II

### 11

For the given functions $f(x)$, let $x_0 = 0$, $x_1 = 0.6$, and $x_2 = 0.9$. Construct interpolation polynomials of degree at most one and at most two to approximate $f(0.45)$, and find the absolute error.

**a.** $f(x) = \cos x$ **c.** $f(x) = \ln(x + 1)$

### 12

For the given functions $f(x)$, let $x_0 = 1$, $x_1 = 1.25$, and $x_2 = 1.6$. Construct interpolation polynomials of degree at most one and at most two to approximate $f(1.4)$, and find the absolute error.

**a.** $f(x) = \sin \pi x$ **c.** $f(x) = \log_{10}(3x - 1)$

### 13

Let $P_3(x)$ be the interpolating polynomial for the data $(0, 0)$, $(0.5, y)$, $(1, 3)$, and $(2, 2)$. The coefficient of $x^3$ in $P_3(x)$ is 6. Find $y$.

### 14

Neville's method is used to approximate $f(0.4)$, giving the following table.

| | | | | |
|---|---|---|---|---|
| $x_0 = 0$ | $P_0 = 1$ | | | |
| $x_1 = 0.25$ | $P_1 = 2$ | $P_{01} = 2.6$ | | |
| $x_2 = 0.5$ | $P_2$ | $P_{1,2}$ | $P_{0,1,2}$ | |
| $x_3 = 0.75$ | $P_3 = 8$ | $P_{2,3} = 2.4$ | $P_{1,2,3} = 2.96$ | $P_{0,1,2,3} = 3.016$ |

Determine $P_2 = f(0.5)$.

### 15

Neville's method is used to approximate $f(0.5)$, giving the following table.

| | | | |
|---|---|---|---|
| $x_0 = 0$ | $P_0 = 0$ | | |
| $x_1 = 0.4$ | $P_1 = 2.8$ | $P_{0,1} = 3.5$ | |
| $x_2 = 0.7$ | $P_2$ | $P_{1,2}$ | $P_{0,1,2} = \frac{27}{7}$ |

Determine $P_2 = f(0.7)$.

### 16

Neville's Algorithm is used to approximate $f(0)$ using $f(-2)$, $f(-1)$, $f(1)$, and $f(2)$. Suppose $f(-1)$ was overstated by 2 and $f(1)$ was understated by 3. Determine the error in the original calculation of the value of the interpolating polynomial to approximate $f(0)$.

### 17

Use the Newton forward-difference formula to construct interpolating polynomials of degree one, two, and three for the following data. Approximate the specified value using each of the polynomials.

**a.** $f(0.43)$ if $f(0) = 1$, $f(0.25) = 1.64872$, $f(0.5) = 2.71828$, $f(0.75) = 4.48169$

**b.** $f(0.18)$ if $f(0.1) = -0.29004986$, $f(0.2) = -0.56079734$, $f(0.3) = -0.81401972$, $f(0.4) = -1.0526302$

### 18

Use the Newton backward-difference formula to construct interpolating polynomials of degree one, two, and three for the following data. Approximate the specified value using each of the polynomials.

**a.** $f(0.43)$ if $f(0) = 1$, $f(0.25) = 1.64872$, $f(0.5) = 2.71828$, $f(0.75) = 4.48169$

**b.** $f(0.25)$ if $f(-1) = 0.86199480$, $f(-0.5) = 0.95802009$, $f(0) = 1.0986123$, $f(0.5) = 1.2943767$

### 19

Determine the natural cubic spline $S$ that interpolates the data $f(0) = 0$, $f(1) = 1$, and $f(2) = 2$.

### 20

Determine the clamped cubic spline $s$ that interpolates the data $f(0) = 0$, $f(1) = 1$, $f(2) = 2$ and satisfies $s'(0) = s'(2) = 1$.

UNIT-III

21

Use the forward-difference formulas and backward-difference formulas to determine each missing entry in the following tables.

a.

| $x$ | $f(x)$ | $f'(x)$ |
|---|---|---|
| 0.5 | 0.4794 | |
| 0.6 | 0.5646 | |
| 0.7 | 0.6442 | |

b.

| $x$ | $f(x)$ | $f'(x)$ |
|---|---|---|
| 0.0 | 0.00000 | |
| 0.2 | 0.74140 | |
| 0.4 | 1.3718 | |

22

Derive a method for approximating $f'''(x_0)$ whose error term is of order $h^2$ by expanding the function $f$ in a fourth Taylor polynomial about $x_0$ and evaluating at $x_0 \pm h$ and $x_0 \pm 2h$.

23

The forward-difference formula can be expressed as

$$f'(x_0) = \frac{1}{h}[f(x_0+h) - f(x_0)] - \frac{h}{2}f''(x_0) - \frac{h^2}{6}f'''(x_0) + O(h^3).$$

Use extrapolation to derive an $O(h^3)$ formula for $f'(x_0)$.

24

Show that

$$\lim_{h\to 0}\left(\frac{2+h}{2-h}\right)^{1/h} = e.$$

25

Approximate the following integrals using the Trapezoidal rule.

a. $\int_{0.5}^{1} x^4\,dx$

b. $\int_{0}^{0.5} \frac{2}{x-4}\,dx$

c. $\int_{1}^{1.5} x^2 \ln x\,dx$

d. $\int_{0}^{1} x^2 e^{-x}\,dx$

26

The Trapezoidal rule applied to $\int_0^2 f(x)\,dx$ gives the value 5, and the Midpoint rule gives the value 4. What value does Simpson's rule give?

27

The quadrature formula $\int_0^2 f(x)\,dx = c_0 f(0) + c_1 f(1) + c_2 f(2)$ is exact for all polynomials of degree less than or equal to 2. Determine $c_0$, $c_1$, and $c_2$.

28

Romberg integration is used to approximate

$$\int_2^3 f(x)\,dx.$$

If $f(2) = 0.51342$, $f(3) = 0.36788$, $R_{31} = 0.43687$, and $R_{33} = 0.43662$, find $f(2.5)$.

29

Use Romberg integration to compute $R_{3,3}$ for the following integrals.

a. $\int_{1}^{1.5} x^2 \ln x\,dx$

b. $\int_{0}^{1} x^2 e^{-x}\,dx$

30

Use Romberg integration to compute $R_{3,3}$ for the following integrals.

a. $\int_{-1}^{1} (\cos x)^2\,dx$

b. $\int_{-0.75}^{0.75} x \ln(x+1)\,dx$

DSE-1F/A COMPLEX ANALYSIS BS: 606

Theory: 3 credits and Practicals: 1 credits
Theory: 3 hours /week and Practicals: 2 hours /week

Objective: Analytic Functions, contour integration and calculus of residues will be introduced to the students.

Outcome: Students realize calculus of residues is one of the power tools in solvng some problems. like improper and definite integrals, effortlessly.

Unit – I

Regions in the Complex Plane - Analytic Functions - Functions of a Complex Variable - Mappings - Mappings by the Exponential Function - Limits - Theorems on Limits - Limits Involving the Point at Infinity - Continuity - Derivatives - Differentiation Formulas - Cauchy–Riemann Equations - Sufficient Conditions for Differentiability - Polar Coordinates-Harmonic Functions

Elementary Functions: The Exponential Function - The Logarithmic Function - Branches and Derivatives of Logarithms - Some Identities Involving Logarithms Complex Exponents - Trigonometric Functions - Hyperbolic Functions

Unit – II

Integrals: Derivatives of Functions w(t) - Definite Integrals of Functions w(t) - Contours - Contour Integrals - Some Examples - Examples with Branch Cuts - Upper Bounds for Moduli of Contour Integrals -Antiderivatives

Unit – III

Cauchy–Goursat Theorem - Proof of the Theorem - Simply Connected Domains - Multiply Connected Domains - Cauchy Integral Formula - An Extension of the Cauchy Integral Formula - Some Consequences of the Extension - Liouville's Theorem and the Fundamental Theorem of Algebra- Maximum Modulus Principle

**Text**: James Ward Brown and Ruel V. Churchill, *Complex Variables and Applications (8e)*

**References:** Joseph Bak and Donald J Newman, Complex *analysis*

Lars V Ahlfors, *Complex Analysis*

S.Lang, Complex *Analysis*

B Choudary, *The Elements Complex Analysis*

# Complex Analysis
## Practicals Question Bank

### UNIT-I

1

Sketch the following sets and determine which are domains:

*(a)* $|z - 2 + i| \le 1$; *(b)* $|2z + 3| > 4$;
*(c)* $\operatorname{Im} z > 1$; *(d)* $\operatorname{Im} z = 1$;

2

Sketch the region onto which the sector $r \le 1$, $0 \le \theta \le \pi/4$ is mapped by the transformation *(a)* $w = z^2$; *(b)* $w = z^3$; *(c)* $w = z^4$.

3

find all roots of the equation

*(a)* $\sinh z = i$; *(b)* $\cosh z = \dfrac{1}{2}$.

4

Find all values of $z$ such that

*(a)* $e^z = -2$; *(b)* $e^z = 1 + \sqrt{3}i$; *(c)* $\exp(2z - 1) = 1$.

5

Show that

$$\lim_{z \to z_0} f(z)g(z) = 0 \quad \text{if} \quad \lim_{z \to z_0} f(z) = 0$$

and if there exists a positive number $M$ such that $|g(z)| \le M$ for all $z$ in some neighborhood of $z_0$.

6

show that $f'(z)$ does not exist at any point if *(a)* $f(z) = \bar{z}$; *(b)* $f(z) = z - \bar{z}$; *(c)* $f(z) = 2x + ixy^2$; *(d)* $f(z) = e^x e^{-iy}$.

7

verify that each of these functions is entire:

*(a)* $f(z) = 3x + y + i(3y - x)$; *(b)* $f(z) = \sin x \cosh y + i \cos x \sinh y$;

*(c)* $f(z) = e^{-y} \sin x - ie^{-y} \cos x$; *(d)* $f(z) = (z^2 - 2)e^{-x}e^{-iy}$.

8

State why a composition of two entire functions is entire. Also, state why any *linear combination* $c_1 f_1(z) + c_2 f_2(z)$ of two entire functions, where $c_1$ and $c_2$ are complex constants, is entire.

9

Show that $u(x, y)$ is harmonic in some domain and find a harmonic conjugate $v(x, y)$ when

*(a)* $u(x, y) = 2x(1 - y)$; *(b)* $u(x, y) = 2x - x^3 + 3xy^2$;
*(c)* $u(x, y) = \sinh x \sin y$; *(d)* $u(x, y) = y/(x^2 + y^2)$.

10

Show that if $v$ and $V$ are harmonic conjugates of $u(x, y)$ in a domain $D$, then $v(x, y)$ and $V(x, y)$ can differ at most by an additive constant.

UNIT-II

11

evaluate

$$\int_C f(z)\,dz.$$

$f(z) = (z+2)/z$ and $C$ is

(a) the semicircle $z = 2e^{i\theta}$ $(0 \le \theta \le \pi)$;

(b) the semicircle $z = 2e^{i\theta}$ $(\pi \le \theta \le 2\pi)$;

(c) the circle $z = 2e^{i\theta}$ $(0 \le \theta \le 2\pi)$.

12

$f(z)$ is defined by means of the equations

$$f(z) = \begin{cases} 1 & \text{when } y < 0, \\ 4y & \text{when } y > 0, \end{cases}$$

and $C$ is the arc from $z = -1 - i$ to $z = 1 + i$ along the curve $y = x^3$.

13

Let $C$ denote the line segment from $z = i$ to $z = 1$. By observing that of all the points on that line segment, the midpoint is the closest to the origin, show that

$$\left| \int_C \frac{dz}{z^4} \right| \le 4\sqrt{2}$$

without evaluating the integral.

14

Let $C_R$ denote the upper half of the circle $|z| = R$ $(R > 2)$, taken in the counterclockwise direction. Show that

$$\left| \int_{C_R} \frac{2z^2 - 1}{z^4 + 5z^2 + 4}\,dz \right| \le \frac{\pi R(2R^2 + 1)}{(R^2 - 1)(R^2 - 4)}.$$

Then, by dividing the numerator and denominator on the right here by $R^4$, show that the value of the integral tends to zero as $R$ tends to infinity.

15

By finding an antiderivative, evaluate each of these integrals, where the path is any contour between the indicated limits of integration:

(a) $\displaystyle\int_i^{i/2} e^{\pi z}\,dz$; (b) $\displaystyle\int_0^{\pi+2i} \cos\left(\frac{z}{2}\right) dz$; (c) $\displaystyle\int_1^3 (z-2)^3\,dz$.

16

Use an antiderivative to show that for every contour $C$ extending from a point $z_1$ to a point $z_2$,

$$\int_C z^n\,dz = \frac{1}{n+1}(z_2^{n+1} - z_1^{n+1}) \qquad (n = 0, 1, 2, \ldots).$$

17

Let $C_0$ and $C$ denote the circles

$$z = z_0 + Re^{i\theta} \ (-\pi \le \theta \le \pi) \quad \text{and} \quad z = Re^{i\theta} \ (-\pi \le \theta \le \pi),$$

respectively.

*(a)* Use these parametric representations to show that

$$\int_{C_0} f(z - z_0)\, dz = \int_C f(z)\, dz$$

18

evaluate the integral

$$\int_C z^m \bar{z}^n dz,$$

where $m$ and $n$ are integers and $C$ is the unit circle $|z| = 1$, taken counterclockwise.

19

$f(z) = 1$ and $C$ is an arbitrary contour from any fixed point $z_1$ to any fixed point $z_2$ in the $z$ plane.

evaluate

$$\int_C f(z)\, dz.$$

20

$f(z) = \pi \exp(\pi \bar{z})$ and $C$ is the boundary of the square with vertices at the points 0, 1, $1 + i$, and $i$, the orientation of $C$ being in the counterclockwise direction.

evaluate

$$\int_C f(z)\, dz.$$

UNIT-III

21

Let $C$ denote the positively oriented boundary of the square whose sides lie along the lines $x = \pm 2$ and $y = \pm 2$. Evaluate each of these integrals:

*(a)* $\displaystyle\int_C \frac{e^{-z}\, dz}{z - (\pi i/2)}$; *(b)* $\displaystyle\int_C \frac{\cos z}{z(z^2 + 8)}\, dz$; *(c)* $\displaystyle\int_C \frac{z\, dz}{2z + 1}$;

22

Find the value of the integral of $g(z)$ around the circle $|z - i| = 2$ in the positive sense when

*(a)* $g(z) = \dfrac{1}{z^2 + 4}$; *(b)* $g(z) = \dfrac{1}{(z^2 + 4)^2}$.

23

Let $C$ be the circle $|z| = 3$, described in the positive sense. Show that if

$$g(z) = \int_C \frac{2s^2 - s - 2}{s - z}\, ds \qquad (|z| \neq 3),$$

then $g(2) = 8\pi i$. What is the value of $g(z)$ when $|z| > 3$?

24

Let $C$ be any simple closed contour, described in the positive sense in the $z$ plane, and write

$$g(z) = \int_C \frac{s^3 + 2s}{(s - z)^3}\, ds.$$

Show that $g(z) = 6\pi i z$ when $z$ is inside $C$ and that $g(z) = 0$ when $z$ is outside.

25

Show that if $f$ is analytic within and on a simple closed contour $C$ and $z_0$ is not on $C$, then

$$\int_C \frac{f'(z)\,dz}{z-z_0} = \int_C \frac{f(z)\,dz}{(z-z_0)^2}.$$

26

Let $C$ be the unit circle $z = e^{i\theta}\ (-\pi \le \theta \le \pi)$. First show that for any real constant $a$,

$$\int_C \frac{e^{az}}{z}\,dz = 2\pi i.$$

Then write this integral in terms of $\theta$ to derive the integration formula

$$\int_0^{\pi} e^{a\cos\theta}\cos(a\sin\theta)\,d\theta = \pi.$$

27

Suppose that $f(z)$ is entire and that the harmonic function $u(x, y) = \mathrm{Re}[f(z)]$ has an upper bound $u_0$; that is, $u(x, y) \le u_0$ for all points $(x, y)$ in the $xy$ plane. Show that $u(x, y)$ must be constant throughout the plane.

28

Let a function $f$ be continuous on a closed bounded region $R$, and let it be analytic and not constant throughout the interior of $R$. Assuming that $f(z) \ne 0$ anywhere in $R$, prove that $|f(z)|$ has a *minimum value* $m$ in $R$ which occurs on the boundary of $R$ and never in the interior. Do this by applying the corresponding result for maximum

29

Let the function $f(z) = u(x, y) + iv(x, y)$ be continuous on a closed bounded region $R$, and suppose that it is analytic and not constant in the interior of $R$. Show that the component function $v(x, y)$ has maximum and minimum values in $R$ which are reached on the boundary of $R$ and never in the interior, where it is harmonic.

30

Let $f$ be the function $f(z) = e^z$ and $R$ the rectangular region $0 \le x \le 1, 0 \le y \le \pi$. Illustrate results in Sec. 54 and Exercise 6 by finding points in $R$ where the component function $u(x, y) = \mathrm{Re}[f(z)]$ reaches its maximum and minimum values.

DSE-1F/B | VECTOR CALCULUS | BS: 606

# VECTOR CALCULUS

Theory: 3 credits and Practicals: 1 credits

Theory: 3 hours /week and Practicals: 2 hours /week

Objective: Concepts like gradient, divergence, curl and their physical relevance will be taught.

Outcome: Students realize the way vector calculus is used to addresses some of the problems of physics.

Unit I

Line Integrals: Introductory Example : Work done against a Force-Evaluation of Line Integrals-Conservative Vector Fields-Surface Integrals: Introductory Example : Flow Through a Pipe-Evaluation of Surface Integrals

Unit II

Volume Integrals: Evaluation of Volume integrals

Gradient, Divergence and Curl: Partial differentiation and Taylor series-Partial differentiation-Taylor series in more than one variable-Gradient of a scalar field-Gradients, conservative fields and potentials-Physical applications of the gradient

Unit III

Divergence of a vector field -Physical interpretation of divergence-Laplacian of a scalar field-Curl of a vector field-Physical interpretation of curl-Relation between curl and rotation-Curl and conservative vector fields.

**Text**: P.C. Matthews, Vector *Calculus.*

**References:** G.B. Thomas and R.L. Finney, *Calculus*
H. Anton, I. Bivens and S. Davis, *Calculus*

# Vector Calculus

## Practicals Question Bank

UNIT-I

1

Evaluate the line integral

$$\int_C \boldsymbol{F} \times d\boldsymbol{r},$$

where $\boldsymbol{F}$ is the vector field $(y, x, 0)$ and $C$ is the curve $y = \sin x$, $z = 0$, between $x = 0$ and $x = \pi$.

2

Evaluate the line integral

$$\int_C x + y^2\, d\boldsymbol{r},$$

where $C$ is the parabola $y = x^2$ in the plane $z = 0$ connecting the points $(0, 0, 0)$ and $(1, 1, 0)$.

3

Evaluate the line integral

$$\int_C \boldsymbol{F} \cdot d\boldsymbol{r} \qquad \text{where} \qquad \boldsymbol{F} = (5z^2, 2x, x + 2y)$$

and the curve $C$ is given by $x = t$, $y = t^2$, $z = t^2$, $0 \le t \le 1$.

4

Find the line integral of the vector field $\boldsymbol{u} = (y^2, x, z)$ along the curve given by $z = y = e^x$ from $x = 0$ to $x = 1$.

5

Evaluate the surface integral of $\boldsymbol{u} = (y, x^2, z^2)$, over the surface $S$, where $S$ is the triangular surface on $x = 0$ with $y \ge 0$, $z \ge 0$, $y + z \le 1$, with the normal $\boldsymbol{n}$ directed in the positive $x$ direction.

6

Find the surface integral of $\boldsymbol{u} = \boldsymbol{r}$ over the part of the paraboloid $z = 1 - x^2 - y^2$ with $z > 0$, with the normal pointing upwards.

7

If $S$ is the entire $x$, $y$ plane, evaluate the integral

$$I = \iint_S e^{-x^2-y^2}\, dS,$$

by transforming the integral into polar coordinates.

8

Find the line integral $\oint_C \boldsymbol{r} \times d\boldsymbol{r}$ where the curve $C$ is the ellipse $x^2/a^2 + y^2/b^2 = 1$ taken in an anticlockwise direction. What do you notice about the magnitude of the answer?

9

By considering the line integral of $\boldsymbol{F} = (y, x^2 - x, 0)$ around the square in the $x$, $y$ plane connecting the four points $(0, 0)$, $(1, 0)$, $(1, 1)$ and $(0, 1)$, show that $\boldsymbol{F}$ cannot be a conservative vector field.

10

Evaluate the line integral of the vector field $\boldsymbol{u} = (xy, z^2, x)$ along the curve given by $x = 1 + t$, $y = 0$, $z = t^2$, $0 \le t \le 3$.

UNIT-II

11

A cube $0 \leq x, y, z, \leq 1$ has a variable density given by $\rho = 1 + x + y + z$. What is the total mass of the cube?

12

Find the volume of the tetrahedron with vertices at $(0,0,0)$, $(a,0,0)$, $(0,b,0)$ and $(0,0,c)$.

13

Evaluate the surface integral of $\boldsymbol{u} = (xy, x, x+y)$ over the surface $S$ defined by $z = 0$ with $0 \leq x \leq 1$, $0 \leq y \leq 2$, with the normal $\boldsymbol{n}$ directed in the positive $z$ direction.

14

Find the surface integral of $\boldsymbol{u} = \boldsymbol{r}$ over the surface of the unit cube $0 \leq x, y, z \leq 1$, with $\boldsymbol{n}$ pointing outward.

15

The surface $S$ is defined to be that part of the plane $z = 0$ lying between the curves $y = x^2$ and $x = y^2$. Find the surface integral of $\boldsymbol{u} \cdot \boldsymbol{n}$ over $S$ where $\boldsymbol{u} = (z, xy, x^2)$ and $\boldsymbol{n} = (0,0,1)$.

16

Find the surface integral of $\boldsymbol{u} \cdot \boldsymbol{n}$ over $S$ where $S$ is the part of the surface $z = x + y^2$ with $z < 0$ and $x > -1$, $\boldsymbol{u}$ is the vector field $\boldsymbol{u} = (2y + x, -1, 0)$ and $\boldsymbol{n}$ has a negative $z$ component.

17

Find the volume integral of the scalar field $\phi = x^2 + y^2 + z^2$ over the region $V$ specified by $0 \leq x \leq 1$, $1 \leq y \leq 2$, $0 \leq z \leq 3$.

18

Find the volume of the section of the cylinder $x^2 + y^2 = 1$ that lies between the planes $z = x + 1$ and $z = -x - 1$.

19 Find the unit normal $\boldsymbol{n}$ to the surface $x^2 + y^2 - z = 0$ at the point $(1,1,2)$.

20 Find the gradient of the scalar field $f = xyz$, and evaluate it at the point (1,2,3). Hence find the directional derivative of $f$ at this point in the direction of the vector $(1,1,0)$.

UNIT-III

21

Find the divergence of the vector field $\boldsymbol{u} = \boldsymbol{r}$.

22

The vector field $\boldsymbol{u}$ is defined by $\boldsymbol{u} = (xy, z + x, y)$. Calculate $\nabla \times \boldsymbol{u}$ and find the points where $\nabla \times \boldsymbol{u} = 0$.

23

Find the gradient $\nabla\phi$ and the Laplacian $\nabla^2\phi$ for the scalar field $\phi = x^2 + xy + yz^2$.

24

Find the gradient and Laplacian of

$$\phi = \sin(kx)\sin(ly)\exp(\sqrt{k^2 + l^2}z).$$

25

Find the unit normal to the surface $xy^2 + 2yz = 4$ at the point $(-2, 2, 3)$.

26

For $\phi(x, y, z) = x^2 + y^2 + z^2 + xy - 3x$, find $\nabla\phi$ and find the minimum value of $\phi$.

27

Find the equation of the plane which is tangent to the surface $x^2 + y^2 - 2z^3 = 0$ at the point $(1, 1, 1)$.

28

Find both the divergence and the curl of the vector fields

(a) $\boldsymbol{u} = (y, z, x)$;

(b) $\boldsymbol{v} = (xyz, z^2, x - y)$.

29

For what values, if any, of the constants $a$ and $b$ is the vector field $\boldsymbol{u} = (y\cos x + axz, b\sin x + z, x^2 + y)$ irrotational?

30

(a) Show that $\boldsymbol{u} = (y^2 z, -z^2 \sin y + 2xyz, 2z\cos y + y^2 x)$ is irrotational.

(b) Find the corresponding potential function.

(c) Hence find the value of the line integral of $\boldsymbol{u}$ along the curve $x = \sin \pi t/2$, $y = t^2 - t$, $z = t^4$, $0 \le t \le 1$.

# MOOCs Resources

# University Exam (Practical)

Time: 2 Hours. Max.Marks: 25

Answer any FOUR of the following EIGHT questions. Each carries four marks. Marks totaling 16 marks.

Q1.From Unit I

Or

Q2.From Unit I

Q3.From Unit II

Or

Q4.From Unit II

Q5.From Unit III

Or

Q6.From Unit III

Q7.From Unit IV

Or

Q8.From Unit IV

VIVA -- 5 Marks.

RECORD -- 4 Marks.

**SATAVAHANA UNIVERSITY, KARIMNAGAR.**

**CBCS Pattern with Semester System (w.e.f.2016-2017)**

**B.Sc (Statistics) II Year- Semester –III**

**Paper –III- Statistical Methods**

**(Question Bank for Practical Examinations)**

## UNIT – I

1. Calculate the Co-efficient of Correlation between X and Y for the following data.

| X | 1 | 2 | 4 | 5 | 7 | 8 | 10 |
|---|---|---|---|---|---|---|---|
| Y | 2 | 6 | 8 | 10 | 14 | 16 | 20 |

2. Two variables X and Y are connected by the equation ax+by+c=0. Show that the correlation between them is -1, if the signs of ‘ a’ and ‘ b’ are alike and +1, if they are different.

3. From the following data calculate the Rank Correlation Co-efficient.

| X | 48 | 33 | 40 | 9 | 16 | 16 | 65 | 24 | 16 | 57 |
|---|---|---|---|---|---|---|---|---|---|---|
| Y | 13 | 13 | 24 | 6 | 15 | 4 | 20 | 9 | 6 | 19 |

4. The 10 competitors in a beauty contest are ranked by three judges in the following order.

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| I-Judge | 1 | 6 | 5 | 10 | 3 | 2 | 4 | 9 | 7 | 8 |
| II-Judge | 3 | 5 | 8 | 4 | 7 | 10 | 2 | 1 | 6 | 9 |
| III-Judge | 6 | 4 | 9 | 8 | 1 | 2 | 3 | 10 | 5 | 7 |

Use the Correlation Co-efficient to determine which pair of judges has nearest approach to common taste in beauty.

5. Derive the lines of regression of X on Y and Y on X.

| X | 17 | 13 | 9 | 5 | 1 |
|---|---|---|---|---|---|
| Y | 9 | 7 | 5 | 3 | 1 |

6. Obtain the regression equation of Y on X and X on Y from the following the marks in Accountancy and Statistics.

| | | Marks in Accountancy | | | | Total |
|---|---|---|---|---|---|---|
| Marks in Statistics | Y \ X | 5-15 | 15-25 | 25-35 | 35-45 | |
| | 0-10 | 1 | 1 | _ | _ | 2 |
| | 10-20 | 3 | 6 | 5 | 1 | 15 |
| | 20-30 | 1 | 8 | 9 | 2 | 20 |
| | 30-40 | _ | 3 | 9 | 3 | 15 |
| | 40-50 | _ | _ | 4 | 4 | 8 |
| | Total | 5 | 18 | 27 | 10 | **60** |

7. Fit a Straight line to the following data.

| X | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| No.of Students | 2.4 | 3 | 3.6 | 4 | 5 | 6 |

8. Fit a Second degree parabola for the following data.

| X | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| Y | 1 | 5 | 10 | 22 | 38 |

9. Fit an exponential curve of the form **$Y= ae^{bx}$** to the following data.

| X | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|
| Y | 8.3 | 15.4 | 33.1 | 65.2 | 127.4 |

10. Compute Correlation Ratio $\eta_{xy}$ from the following table.

| Y \ X | 10 | 15 | 20 | 25 |
|---|---|---|---|---|
| 7 | 3 | 2 | _ | _ |
| 9 | _ | 1 | 4 | 6 |
| 11 | _ | 3 | 4 | 2 |
| 13 | 2 | 1 | 5 | _ |
| 15 | _ | 6 | _ | 1 |

## UNIT-II

**11.** Between three variables $X_1$, $X_2$ and $X_3$ simple correlation coefficients are given: $\mathbf{r_{12} = 0.59}$; $\mathbf{r_{13} = 0.46}$; and $\mathbf{r_{23} = 0.77}$. Compute the Partial Correlation Coefficient $\mathbf{r_{12.3}}$ and Multiple Correlation Coefficient $\mathbf{R_{1.23}}$

12. In a studying of random samples of 120 students, the following results are obtained.

$X_1$ –bar = 68; $X_2$ –bar =70; $X_3$ –bar =74;

$S_1^2 = V(X_1) = 100$; $S_2^{\,2} = V(X_2) = 25$; $S_3^{\,2} = V(X_3) = 8$;

$r_{12} = 0.60$; $r_{13} = 0.70$; and $r_{23} = 0.65$

Compute $r_{12.3}$ and $R_{3.12}$ i) If $R_{3.12} = 0$ does it fallow that $R_{1.23} = 0$

ii) If $R_{3.12} = 1$ does it fallow that $R_{1.23} = 1$

13. Is it possible to get the following form a set of experimental data?

a) $\mathbf{r}_{23} = 0.8$; $\mathbf{r}_{31} = -0.5$; and $\mathbf{r}_{12} = 0.6$;

b) $\mathbf{r}_{23} = 0.7$ ; $\mathbf{r}_{31} = -0.4$; and $\mathbf{r}_{12} = 0.6$;

14. a) If $\mathbf{r}_{12} = \mathbf{r}_{13} = \mathbf{r}_{23} = r$; $(r \neq 1)$ then prove that

$$\mathbf{R}_{1.23} = \mathbf{R}_{2.13} = \mathbf{R}_{3.12} = r = \sqrt{2} / (1+r).$$

b) $\mathbf{R}_{1.23} = 1$; Prove that $\mathbf{R}_{3.12} = \mathbf{R}_{2.13} = 1$

15. Given the following frequencies of the positive classes .Find the frequencies of the rest of the classes.(A) = 977; (B) = 1185; (C) = 596; (AB) = 453; (BC) = 250; (AC) = 284; (ABC) = 127; and N= 12000.

16. A student reported the results of a survey in the following manner in terms of usual notation.(A) = 525; (B) = 312; (C) = 470; (AB) = 42; (BC) = 60; (AC) = 147; (ABC) = 25; and N= 1000.Examine the Consistency of the data.

17. In an university examination 65% of the candidates passed in English, 90% passed in Second language and 60% passed in the Optional subjects. Find how many candidates at least should have passed in the whole examination.

18. Show that i) If all A's are B's and B's are C's then all A's are C's

ii) If all A's are B's and no B's are C's then no A's are C's

19. Find A and B are independent or positively associated or negatively associated in which of following cases. i) N= 1500; (B) = 600; ($\alpha$) = 800; (AB) = 500;

ii) (AB) = 256; ($\alpha$B) = 294; (A$\beta$ ) = 48; ($\alpha\beta$) = 144;

20. N =1000 ;(A) = 470; (B) = 620; and (AB) = 320; Find the Co-efficient of Contingency.

## UNIT-III

21. Obtain the relationship between t and F

22. If $X_1, X_2 \ldots X_n$ are identically independent distributed  $N(\mu,\sigma^2)$ then show that $E(s^2)=\sigma^2$ and

$$V(s^2) = \frac{2\sigma^4}{(n-1)}$$

23. $X_1$, $X_2$ and $X_3$ is a random sample of size 3 from a population with mean $\mu$ and variance $\sigma^2$.
$T_1$, $T_2$, and $T_3$ are the estimators used to estimate mean value ,
where $T_1 = X_1 + X_2 - X_3$ ; $T_2 = 2X_1 + 3X_3 - 4X_2$ ; $T_3 = 1/3(\lambda X_1 + X_2 + X_3)$

a) Are $T_1$ and, $T_2$ are unbiased estimators?

b) Find the value of $\lambda$ such that $T_3$ is unbiased?

c) With this value of $\lambda$ is $T_3$ is consistent estimator?

d) Which is the best estimator among the three

24. Let $(X_1, X_2 \ldots X_n)$  $N(\theta,\sigma^2)$ then show that X-bar is consistent estimator for $\theta$ .

25. Obtain the relationship between F and $\chi^2$

26. Show that $t = \frac{\sum x_i}{(n+1)}$ is more efficient estimator , then sample mean X- bar for estimating population mean $\mu$ of the normal with variance $\sigma^2$.

27. Show that $T = \sum x_i$ is a sufficient estimator for the Poisson population parameter $\lambda$.

28. If $T_1$ is an MVUE of $\tau(\theta)$ and, $T_2$ is any other unbiased estimator of $\tau(\theta)$ with efficiency e<1, then no unbiased linear combination of $T_1$ and, $T_2$ can be an MVUE of $\tau(\theta)$.

29. Find MVUE for the parameter $\lambda$ in Poisson distribution.
30. If T is unbiased estimator of $\theta$. then show that
 i) $T^2$ is not unbiased estimator of $\theta^2$.
 ii) If T is a consistent estimator of $\theta$ then $T^2$ is also a consistent estimator of $\theta^2$.

## UNIT-IV

31. Write the statement of Neyman-Factorization theorem.
32. Let $X_1, X_2 .... X_n$ be a random sample of Exponential Density Function

$f(x) = \theta .\exp(-\theta\ x)$ ; $x \geq 0$ ; $\theta > 0$;   Find the MLE of $\theta$ .

33. Write the **Four** properties of Maximum Likelihood Estimator.

34. For Gamma distribution $G(x;\alpha,\lambda)$ Find the MLE of $\alpha$ and $\lambda$.

35. Estimate the parameter $\lambda$ of the exponential distribution

$f(x,\lambda) = \lambda \exp(-\lambda x)$ ; $x \geq 0$ ; $\lambda > 0$; by the method of Moments.

36. Estimate $\alpha$ and $\beta$ to the following pdf.

$$f(x;\alpha,\beta)=\frac{\beta^{\alpha}.x^{\alpha-1}e^{-\beta x}}{\Gamma(\alpha)}\ ;\ x \geq 0 \text{ by the method of Moments.}$$

37. Let $X_1, X_2 .... X_n$ be a random sample from a Poisson distribution with parameter $\lambda$. Find MLE of $\lambda$. Also find its Variance.

38. Obtain 95% Confidence Interval for the Variance of a Normal Distribution.

39. The sample values from the population with pdf.

$f(x) = (1+\theta).x^{\theta}$ ; $0<x<1$: $\theta > 0$ are given below.
0.46, 0.38, 0.61, 0.82, 0.59, 0.53, 0.72, 0.44, 0.59, 0.60.
Find the estimator of $\theta$ by the method of moments..

40. A random sample of 700 units from a large consignment showed that 200 were damaged. Find i) 95% and ii) 99% Confidence limits for the proportion of damaged units in the consignment.

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# SATAVAHANA UNIVERSITY,KARIMNAGAR.

## Department of Statistics

**CBCS Pattern with Semester System(w.e.f.2019-2020)**

**B.Sc (Statistics)I Year-Semester–I**

**Paper–I**

**(Descriptive Statistics & Probability)**

**(Question Bank for Practical Examinations)**

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**PART-1**

1. Draw a Histogram and Frequency Polygon from the following data:

| Marks | 0-10 | 10-20 | 20-40 | 40-50 | 50-60 | 60-70 | 70-90 | 90-100 |
|---|---|---|---|---|---|---|---|---|
| No. of Students | 4 | 6 | 14 | 16 | 14 | 8 | 16 | 5 |

2. Draw a Histogram and Frequency Polygon from the following data:

| Monthly Wages(in Rs) | 10-13 | 13-15 | 15-17 | 17-19 | 19-21 | 21-23 | 23-25 |
|---|---|---|---|---|---|---|---|
| No. of Students | 6 | 53 | 85 | 56 | 21 | 16 | 8 |

3. Draw ‘Less than ’and ‘More than “Ogives from the data given below:

| Profits | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 | 60-70 | 70-80 | 80-90 | 90-100 |
|---|---|---|---|---|---|---|---|---|---|
| Lakhs of Rs | 6 | 8 | 12 | 18 | 25 | 16 | 8 | 5 | 2 |

4. Following information is obtained on the no.of telephone calls made by **250**companiesforthemonthofJuneandJuly1999.

| Telephone Calls | 1000-1050 | 1050-1100 | 1100-1150 | 1150-1200 | 1200-1250 | 1250-1300 | 1300-1350 | 1350-1400 |
|---|---|---|---|---|---|---|---|---|
| Companies | 7 | 21 | 32 | 49 | 58 | 41 | 27 | 15 |

Construct (a) More than Ogive (b) Less than Ogive

5. Followingdatarelatetoyear–wiseenrolmentinacollegeclassifiedaccordingtosex.

Draw a sub-divided Bar diagram.

| Telephone Calls | 1990-1991 | 1991-1992 | 1992-1993 | 1993-1994 | 1994-1995 |
|---|---|---|---|---|---|
| No. of Girls | 810 | 825 | 844 | 780 | 820 |
| No. of Boys | 1215 | 1160 | 1325 | 1410 | 1480 |

6. A regional rainfall in dies during the year1988to1990 are given below.

| Year | West | North | East | South | Centre |
|---|---|---|---|---|---|
| **1988** | **78.4** | **88.9** | **83.7** | **89.9** | **86.5** |
| **1989** | **75.6** | **62.5** | **103.6** | **75.5** | **77.4** |
| **1990** | **121.2** | **116.5** | **107.6** | **123.9** | **90.3** |

Represent the data by Multiple Bar Diagram.

7. a)Draw a suitable bar diagram to represent the following data related to a school.

| Year | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 |
|---|---|---|---|---|---|---|
| **No. of Students** | **210** | **242** | **290** | **315** | **340** | **355** |

b)DepictthefollowingdatabyasuitablediagramBalanceofTrade=Export-Import)

| Year | Export | Import |
|---|---|---|
| 1993 | 98 | 115 |
| 1994 | 110 | 140 |
| 1995 | 115 | 96 |
| 1996 | 120 | 100 |

8. The growth of production of fish for the period 1950-51to1986-87 is given below. Represent the data by a suitable diagram.

| Year | Marine | Inland |
|---|---|---|
| **1950-51** | **5.34** | **2.18** |
| **1960-61** | **8.80** | **2.80** |
| **1970-71** | **10.86** | **6.70** |
| **1980-81** | **15.55** | **8.87** |
| **1984-85** | **16.98** | **11.03** |
| **1985-86** | **17.16** | **11.60** |
| **1986-87** | **12.47** | **8.42** |

9. DrawaPiediagramforthefollowingdataofsixfive-yearplanpublicsector outlays.

| | | |
|---|---|---|
| **1** | **Agricultural and Rural Development** | **12.9%** |
| **2** | **Irrigation etc.** | **12.5%** |
| **3** | **Energy** | **27.2%** |
| **4** | **Industry and Minerals** | **15.4%** |
| **5** | **Transport, Communication etc.** | **15.9%** |
| **6** | **Social Service and Other** | **16.1%** |

10. The following data relates to the Expenditure(Rs) of two families A and B. Draw a Multiple Pie-diagram.

| **S. No** | **Items of Expenditure** | **Family-A** | **Family-B** |
|---|---|---|---|
| | | **Expenditure(Rs)** | **Expenditure(Rs)** |
| **1** | **Food** | **1200** | **1700** |
| **2** | **Clothing** | **500** | **800** |
| **3** | **House Rent** | **600** | **900** |
| **4** | **Fuel and Electricity** | **250** | **300** |
| **5** | **Miscellaneous** | **450** | **800** |

11. Calculatethefirstfourmomentsaboutthemeanforthefollowingdata.Also Calculate $\beta_1$ and $\beta_2$

| **x** | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
|---|---|---|---|---|---|---|---|---|
| **f** | **1** | **8** | **28** | **56** | **70** | **56** | **28** | **8** |

12. Foradistributionthemean**is10**,Varianceis**16**$\gamma_1=+1$,and$\beta_2=4$Find the First four moments about the origin.

**13.** In certain distribution the first four moments about the **point 4** are **-1.517** -30 and 108**.** Calculate the four moments about mean.

14. Calculate the first four central moments for the following data.

| **x** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** |
|---|---|---|---|---|---|---|---|---|---|
| **f** | **1** | **6** | **13** | **25** | **30** | **22** | **9** | **5** | **2** |

15. From the following data calculate moments about

(i) Assumed Mean25 (ii) Actual Mean (iii) Moments about zero

| **Class** | **0-10** | **10-20** | **20-30** | **30-40** |
|---|---|---|---|---|
| **Frequency** | **1** | **3** | **4** | **2** |

16. Given below is the distribution based on a random sample of 110 items from the production line of an industry. Calculate Sheppard's corrections.

| Class Interval | 100-105 | 105-110 | 110-115 | 115-120 | 120-125 | 125-130 |
|---|---|---|---|---|---|---|
| No .of Employees. | 12 | 26 | 35 | 20 | 12 | 5 |

17. Calculate the first four central moments for the following data and perform Sheppard's corrections.

| Class Interval | 10-15 | 15-20 | 20-25 | 25-30 | 30-35 | 35-40 | 40-45 | 45-50 |
|---|---|---|---|---|---|---|---|---|
| Frequency | 8 | 16 | 30 | 45 | 62 | 32 | 15 | 6 |

18. Calculate Karl Pearson's Co-efficient of Skewness and Bowley's Co-efficient Of Skewness for the following data.

| CI | 10-15 | 15-20 | 20-25 | 25-30 | 30-35 | 35-40 | 40-45 | 45-50 |
|---|---|---|---|---|---|---|---|---|
| F | 8 | 16 | 30 | 45 | 62 | 32 | 15 | 6 |

19Obtain Karl Pearson's Co-efficient of Skewness and Bowley's Co-efficient of Skewness for the following data.

| Class | 5.5-10.5 | 10.5-15.5 | 15.5-20.5 | 20.5-25.5 | 25.5-30.5 | 30.5-35.5 | 35.5-40.5 |
|---|---|---|---|---|---|---|---|
| Frequency | 7 | 7 | 16 | 13 | 2 | 5 | 8 |

20.The daily expenditure of 100 families is given below:

| Daily Expenditure | 0-20 | 20-40 | 40-60 | 60-80 | 80-100 |
|---|---|---|---|---|---|
| No.of families | 13 | ? | 27 | ? | 16 |

If the mode of the distribution is **44**.Calculate the Karl Pearson's Co-efficient of Skewness.

## PART-2

21. DrawtheHistogramforungroupeddatausingMS.EXCEL.

| | | | | | | |
|---|---|---|---|---|---|---|
| **2.4** | **3.9** | **4.7** | **4.9** | **5.9** | **7.9** | **10.3** |
| **3.4** | **3.9** | **4.8** | **4.9** | **6.0** | **8.0** | **10.4** |
| **3.5** | **3.9** | **4.8** | **4.9** | **6.4** | **8.0** | **10.7** |
| **3.5** | **3.9** | **4.8** | **4.9** | **6.4** | **8.0** | **11.0** |
| **3.6** | **4.1** | **4.8** | **4.9** | **6.6** | **8.3** | **11.6** |
| **3.6** | **4.4** | **4.9** | **5.0** | **7.0** | **8.3** | **12.0** |
| **3.6** | **4.5** | **4.9** | **5.4** | **7.2** | **8.5** | |
| **3.8** | **4.6** | **4.9** | **5.8** | **7.4** | **8.6** | |
| **3.9** | **4.7** | **4.9** | **5.8** | **7.7** | **8.8** | |

22. Draw the Histogram for the grouped data using MS.EXCEL.

| **CI** | **20-30** | **30-40** | **40-50** | **50-60** | **60-70** | **70-80** | **80-90** |
|---|---|---|---|---|---|---|---|
| **f** | **4** | **6** | **8** | **12** | **9** | **7** | **4** |

23. Draw the Frequency Polygon for the grouped data using MS.EXCEL.

| **Class** | **0-10** | **10-20** | **20-30** | **30-40** | **40-50** | **50-60** | **60-70** | **70-80** |
|---|---|---|---|---|---|---|---|---|
| **Frequency** | **2** | **8** | **12** | **15** | **19** | **13** | **6** | **1** |

24. Draw the OGIVE curves for the following data using MS.EXCEL.

| **Class** | **10-15** | **15-20** | **20-25** | **25-30** | **30-35** | **35-40** | **40-45** | **45-50** |
|---|---|---|---|---|---|---|---|---|
| **Frequency** | **2** | **4** | **7** | **11** | **15** | **10** | **6** | **2** |

25. Following data relate to the year-wise enrolment of students in a college. Draw a Simple Bar diagram using MS.EXCEL

| **.Year** | **1981-82** | **1982-83** | **1983-84** | **1984-85** | **1985-86** | **1896-87** | **1987-88** |
|---|---|---|---|---|---|---|---|
| **Students Enrolments** | **100** | **175** | **250** | **225** | **300** | **350** | **400** |

26. Draw a Sub–Divided Bar diagram using MS.EXCEL for the following data.

| Year | 1987-88 | 1988-89 | 1989-90 | 1990-91 | 1991-92 | 1992-93 |
|---|---|---|---|---|---|---|
| Boys | 100 | 150 | 240 | 290 | 300 | 350 |
| Girls | 50 | 75 | 170 | 250 | 290 | 320 |

27. Draw a Multiple Bar diagram using MS.EXCEL for the following data.

| Year | 1987-88 | 1988-89 | 1989-90 | 1990-91 | 1991-92 | 1992-93 |
|---|---|---|---|---|---|---|
| Boys | 100 | 150 | 240 | 290 | 300 | 350 |
| Girls | 50 | 75 | 170 | 250 | 290 | 320 |

28. Draw a Pie diagram using MS.EXCEL represent the following data showing the unit Of electricity sold to different classes of consumers during a month by an electricity supplying company.

| S. No | Consumers Class | Percentage of Units Sold |
|---|---|---|
| 1 | Motive Power | 40 |
| 2 | Light & Fans | 30 |
| 3 | Domestic Supply | 25 |
| 4 | Street Light | 5 |

29. Calculate Mean, Variance, Skewness and Kurtosis for Ungrouped data When the reare less than 30 observations.

**10 10 20 20 30 40 50 60 70 20 40 60**

30. Calculate Mean, Variance, Skewness and Kurtosis , **β1&β1**forGrouped data.

| Class | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 | 60-70 | 70-80 |
|---|---|---|---|---|---|---|---|
| Frequency | 1 | 20 | 69 | 108 | 78 | 22 | 2 |

SATAVAHANA UNIVERSITY, KARIMNAGAR.

Department of Statistics

CBCS Pattern with Semester System (w.e.f.2016-2017)

B.Sc (Statistics) Semester –II

Descriptive Statistics and Probability

(Question Bank for Practical Examinations)

## UNIT – I

1. Define Discrete Uniform Distribution and find its Mean and Variance.

2. Define Bernoulli Distribution. In Bernoulli distribution show that all Non-Central Moments are equal to its probability of success.

3. There are 64 beds in a garden and 3 seeds of a particular type of flower are show in each bed. The probability of a flower being white is 1/4 .Find the number of beds with 3, 2, 1, or 0 white flower.

4. The sum and product of the mean and Variance of a Binomial Distribution are 24 and 128.Find the distribution.

5. How many dice must be thrown so that there is a better than even chance of obtain a Six?

6. Define Poisson distribution. In Poisson distribution show that Mean and Variance are equal.

7. State and prove Additive (Reproductive) property of Poisson distribution.

8. The probability that a person exposed to some disease is 0.60.What is the probability that the 15 persons is exposed the disease will be fifth person to catch it.

9. Define Geometric Distribution and find its Mean and Variance.

10. The Mathematics faculty at a college consists of 20 people, 7 of whom are women. If a committee of 5 people is set up at random.What is the probability that precisely 2 of the members will be women.

## UNIT-II

11. Derive the Characteristic function of Discrete Uniform Distribution and hence find its Mean.

12. Derive the Probability Generating function of Bernoulli Distribution and hence find its Mean and Variance.

13. Determine Binomial Distribution for which Mean is 4 and Variance 3 then find its Mode.

14. If X is a random variable following Binomial Distribution with mean 2.4 and Variance 1.44. Find $P(1 \leq X \leq 4)$.

15. Define Binomial Distribution. Find its Mean and Variance from Moment Generating function.

16. Derive Cumulate Generating function of Poisson distribution and find its four Central Moments.

17. X and Y are two independent random variables of Poisson distribution then

$$P(X=1) = P(X=2) \quad \&$$

$$P(Y=2) = P(Y=3) \text{ then find } V(X-2Y).$$

18. Show that Poisson distribution is a limiting case of Negative Binomial Distribution.

19. i) Write the four properties of Geometric Distribution.

ii) Define Lack of Memory.

20. Explain in detail the Recurrence Relations of Hyper Geometric Distribution.

## UNIT-III

21. Define Rectangular (Continuous Uniform) Distribution over (a, b) then find its mean and variance.

22. Define Normal Distribution and find its Central Moments, $\beta_1$ and $\beta 2$ from Cumulate Generating function.

23. If X is a normal variate with mean 30 and st.deviation 5. Find the Probabilities that

i) $26 \leq X \leq 40$

ii) $X \geq 45$

iii) $|X-30| > 5$

24. Define Standard Normal Distribution and find its Mean and Variance from Moment Generating Function.

25. In a Normal Distribution 31% of the items are under 45 and 8% over 64. Find the mean and standard deviation of the distribution.

26. Define Exponential Distribution. Find its Central Moments.

27. The time taken by person while speaking over a telephone is Exponential distribution with Mean 4 minutes.

i) Find the Probability that he speaks for more than 6 minutes but less than 7 minutes.

ii) Out of Six calls that he makes, what is the Probability that exactly 2 calls take him more than 3 minutes each.

ii) How many calls out of 100 are expected to take more than 3 minutes each?

28. Define i) Gamma Distribution with One parameter and with Two parameters.

ii) If X follows $\gamma$ (20).Calculate $\beta_1$and $\beta_2$, where $\gamma$ represents Gamma.

29. Define Beta Distribution of first kind and find its Mean and Variance.

30. Define Cauchy Distribution. State and prove its Additive (Reproductive) property.

**UNIT-IV**

31. If X is a uniformly distributed with Mean 1 and Variance 4/3 find $P(X<0)$.

32. The sum of independent normal variates is also a normal variate.

33. Show that Odd order moments of Normal Distribution about mean are zero.

34. Find the Mode of the Normal Distribution.

35. State and prove of Lack of Memory of Exponential Distribution.

36. Find Mean and Variance of Gamma Distribution with One parameter from Characteristic function.

37. Define Beta Distribution of Second kind and find its Harmonic Mean.

38. Obtain the Characteristic function of Cauchy Distribution.

39. Explain Central Limit Theorem.

40. Explain Week Law of Large Numbers.

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# University Exam (Practical)

Time: 2 Hours. Max.Marks: 25

Answer any FOUR of the following EIGHT questions. Each carries four marks. Marks totaling 16 marks.

Q1.From Unit I

Or

Q2.From Unit I

Q3.From Unit II

Or

Q4.From Unit II

Q5.From Unit III

Or

Q6.From Unit III

Q7.From Unit IV

Or

Q8.From Unit IV

VIVA -- 5 Marks.

RECORD -- 4 Marks.

# SATAVAHANA UNIVERSITY, KARIMNAGAR

## DEPARTMENT OF STATISTICS

CBCS Pattern with Semester System (w.e.f.2016-2017)

## B.Sc (STATISTICS) II-YEAR SEMISTER-IV

## PAPER-IV-STATISTICAL INFERENCE

(Question Bank for Practical Examinations)

# SATAVAHANA UNIVERSITY, KARIMNAGAR.

## Department of Statistics

**CBCS Pattern with Semester System (w.e.f.2016-2017)**

**B.Sc (Statistics) II Year- Semester –IV**

## Paper –IV- Statistical Inference

**(Question Bank for Practical Examinations)**

## UNIT – I

1. Define the terms: a) Types of Errors.

   b) Null Hypothesis and Alternative Hypothesis.

   c) Critical Region.

   d) Power of the test.

2. Define the terms: a) Most powerful test.

   b) Uniformly Most powerful test.

3. State and prove Nayman's -Pearson Lemma.

4. Obtain the Best Critical Region for testing $H_0: p = p_0$ against $H_1: p = p_1$ in a Binomial Distribution.

5 Obtain the Best Critical Region for testing $H_0: \lambda = \lambda_0$ against $H_1: \lambda = \lambda_1$ in a Poisson Distribution.

6. Obtain the Best Critical Region for testing $H_0: \mu = \mu_0$ against $H_1: \mu = \mu_1$ for a Normal Distribution.

7. Obtain the Best Critical Region for testing $H_0: \lambda = \lambda_0$ against $H_1: \lambda = \lambda_1$ for the Exponential Distribution.

8. In a Bernoulli distribution with parameter P, $H_0$ : p= 1/2 against $H_1$: p= 2/3 is rejected if more than 3 heads are obtained out of 5 throws of a coin. Find the probability of type-I, type-II errors and also find power of the test.

9. A manufacturing concern wants to estimate the average amount of purchase of its product in a month by the customers whose standard error is Rs 10/-.Find the sample size if the maximum error is not exceed Rs3/- with a probability of 0.99

10. If $X \geq 1$ is the critical region for testing $H_0 : \theta = 2$ Vs $H_1 : \theta = 1$ on the basis of a single observation from the population $f(x, \theta) = \theta e^{-\theta x}$ ; $x \geq 0$ , $\theta > 0$.Obtain the value of Type I error and Type II error.

## UNIT-II

11. A random sample of 100 items drawn from a universe with mean value 64 and SD 3 has a mean value 6305.Is the difference in the means significant. What will be your inference had 200 items.

12. The mean two large samples 500 and 400 members are 20 and 15 respectively. Can the samples be regarded from the same population with standard deviation 4,

13. In a sample of 500 people in a region 280 were tea drinkers and the rest are coffee drinkers. Can we assume that both coffee and tea drinkers are equally in this region. Test the hypothesis at 5% LOS.

14. Before an increase in excise duty on tea, 800 persons out of a sample of 1000 persons were found to be tea drikers.After an increase in excise duty 800 people were tea drinkers in a sample of 1200 people. Test there is a significant decrease in the consumption of tea after the increase in excise duty.

15. A random sample of size 50 has SD 11.8 drawn from a normal population. Can we assume that the sample has been drawn the population with SD 12,

16. Two random samples drawn from two countries gave the following data relating to the heights of the males.

| | Country -I | Country -II |
|---|---|---|
| **Sample size** | **1000** | **1200** |
| **Mean height(in inches)** | **67.42** | **67.25** |
| **Slandered Deviation** | **2.58** | **2.50** |

17. Two bi-variate random samples of sizes 420 and 225 have correlation co-efficient 0.72 and 0.65 respectively. Test whether there is a significant difference between the sample correlation co-efficient 1% LOS,

18. The mean and SD of 60 students was found to be 145 and 40.Find 95% and 98% confidence limits for the population mean.

19. Find the probability density function of $X_{(n)}$ in a random sample of n observations from an exponential distribution $f(x) = \lambda e^{-\lambda x}$ ;$x>0$ , $\lambda>0$

$= 0$, **other wise**

20. Obtain 99% confidence limits for unknown mean $\mu$ in the samples are large.

## UNIT-III

21. Heights (in inches) of 10 students are given below.

**60 65 62 66 68 70 65 64 68 and 72.**Can we say that variance of the distribution of heights of all students from which the above sample of 10 students was drawn in equal to **50**

22. The following table gives the number of aircraft accidents that occurs during the various days of the week. Find whether the accidents are uniformly distributed over the week

| **Days** | **Sun** | **Mon** | **Tues** | **Wed** | **Thurs** | **Fri** | **Sat** |
|---|---|---|---|---|---|---|---|
| **No.of accidents.** | **14** | **16** | **8** | **12** | **11** | **9** | **14** |

23. Fit a Poisson distribution for the following data and the goodness of fit.

| x | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| f | 142 | 156 | 69 | 27 | 5 | 1 |

24. The theory predicts the proportion of beans in the four groups A,B,C,and D should be 9:3:3:1in an experiment among 1600 beans the numbers in the four groups were 882, 313, 287 and 118.Then the experimental support the theory.

25. Following table provides data with regard to structure of fathers and their first sons at the age of 25 years

| | | **Structure of Father** | |
|---|---|---|---|
| | | **Tall** | **Short** |
| **Structure of Sons** | **Tall** | **8** | **2** |
| | **Short** | **4** | **6** |

Test that the structure of sons is independent of Structure of Fathers

26. **1072** college students were classified according to their intelligence and economic conditions. Test whether there is any association between the two attributes.

| | Intelligence | | | |
|---|---|---|---|---|
| | **Below Average** | **Average** | **Above Average** | **Genius** |
| **Economic Good** | **82** | **181** | **199** | **48** |
| **Condition is not Good** | **106** | **190** | **185** | **81** |

27. A random sample of 10 boys held the following I.Q's: **70 120 110 101 88 83 95 98 107 and 100** Do these data support the assumption of a population mean **I.Q of 100?**

28.The heights of six randomly choosen sailors are **63 65 68 69 71 and 72** (inches).Those of 10 randomly choosen soldiers are **61 62 65 66 69 69 70 71 72 and 73.**Test whether sailors are in the average taller than soldiers at 5%level of significance.

29.A drug was administrated to **10** patients and the increments in their blood pressure were recorded to be **6 3 -2 4 -3 4 6 0 0 and 2.** It is reasonable to believe that the drug has no effect on change of blood pressure.

30. Two random samples of sizes 8 and 11 are drawn from two normal populations are characterised as follows:

| Population | Size of sample | Sum of observations | Sum of Squares of observations |
|---|---|---|---|
| **I** | **8** | **9.6** | **61.52** |
| **II** | **11** | **16.5** | **73.26** |

Test whether two populations can be taken to have same variance

## UNIT-IV

31. Define Non-Parametric Test. Write its assumptions and also write its advantages and disadvantages.

32. A test is conducted for 20 students in a school and marks are given below:

**93 88 107 115 82 97 103 86 113 107 112 90 98 93 99 103 100 101 96 and 104.**The statistical hypothesis of the Median of the students in a school is **99** marks.

33. A coin is tossed and obtain the following results:

**HH TT HH T HHH T HH TT HHH TT HHH T HHH T H.** Test whether the coin is unbiased or not.

34. 25 heads are obtained of 37 throws of a coin. Test whether the coin is unbiased if the total runs are 13

35. A sample of 12 pairs of twins are taken at random and their intelligence score are given below. According to this data test the intelligence level of the first person of the twins is more than the second one.

| Twins | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Score of Ist person | 86 | 79 | 77 | 68 | 91 | 72 | 77 | 91 | 70 | 71 | 88 | 87 |
| Score of Ist person | 88 | 77 | 76 | 64 | 96 | 72 | 65 | 90 | 65 | 80 | 81 | 82 |

36. Use of Mann –Whitney –U test to determine whether the coating was beneficial in reducing the amount of corrosion.

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Un coated | 32 | 27 | 51 | 64 | 45 | 47 | 34 | 45 | 27 | 60 |
| Coated | 39 | 43 | 43 | 52 | 52 | 59 | 40 | 45 | 47 | 62 |

.37. The following data (in tonnes ) are the amounts of sulphur oxides emitted by a large industrial plant in 40days.

**24 15 20 29 19 18 22 25 27 9 17 20 17 6 24 14 15 23 24 26**

**19 23 28 19 16 22 24 17 20 13 19 10 23 18 31 13 20 17 24 14**

Use the sign test to test the null hypothesis $\mu = 21.5$ against the alternative hypothesis $\mu > 21.5$ at 0.01 LOS.

38. By using Median test the equality of populations at 5% LOS.

| | | | | | | |
|---|---|---|---|---|---|---|
| **Sample -I** | **2** | **8** | **6** | **4** | **3** | **-** |
| **Sample -II** | **8** | **2** | **9** | **7** | **5** | **7** |

39. A random sample of 10 observations are selected from a population with values are **20.2 24.1 21.3 17.2 19.8 16.5 21.8 18.7 17.1 and 19.9**

Test whether the Median of the population is 18.

40. Following are the marks obtained by two classes of students in certain examination :

**Class-A 13 12 12 10 10 10 9 8 8 7 7 7 7 6**

**Class-B 17 16 15 15 15 14 14 14 13 13 13 12 12 12 12 11 11 10 10 8 8**

.Using run test test whether the marks obtained by two classless of students are taken from same population.

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# University Practical Exam Pattern

Time: 2 Hours. Max.Marks: 25

Answer FOUR of the following EIGHT questions. Each question carries four marks. Marks totaling 16 marks.

Q1.From Unit I

Or

Q2.From Unit I

Q3.From Unit II

Or

Q4.From Unit II

Q5.From Unit III

Or

Q6.From Unit III

Q7.From Unit IV

Or

Q8.From Unit IV

VIVA -- 5 Marks.

RECORD -- 4 Marks.

# SATAVAHANA UNIVERSITY, KARIMNAGAR.
## Department of Statistics
### CBCS Pattern with Semester System (w.e.f.2021-2022)
### B.Sc (Statistics) III Year- Semester –V
# Paper –V(A) : Applied Statistics - I
### (Question Bank for Practical Examinations)
## UNIT – I

1. Explain Sampling and Non-Sampling errors.

2. Consider a population of 4 units with values 1,2, 3 ,4. Write down all possible samples of size 2 (Without replacement) from this population and Verify that sample mean is unbiased estimate of the population mean and also estimate its sampling variance.

3. Consider a population of 5 units with values 2, 3, 6, 8, 11 consider all possible samples of size 2 which can be drawn with replacement from this population. Calculate the Standard Error of sample mean. Also calculate the Standard Error of the sample mean when the samples of size 2 are drawn without replacement.

4. Explain Subjectivity Sampling and Probability Sampling.

5. Derive the Variance of Sample mean under SRSWR.

6. Consider a population of 5 units with values 3 5,7,9,11 Write down all possible samples of size 2 (With replacement) from this population and Verify that sample mean is unbiased estimate of the population mean.

7. Explain the Random numbers method.

8. There are 200 small industrial establishments in a city. The number of employees in each establishment in a simple random sample of size 20 establishments is given below.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **12** | **28** | **39** | **52** | **76** | **81** | **75** | **84** | **28** | **68** |
| **98** | **35** | **82** | **13** | **20** | **52** | **15** | **21** | **43** | **59** |

Estimate the average no. of employees per establishment in city and find Standard Error of estimate.

9. Explain the Lottery method.

10. Define Population proportion'P' and Sample proportion p and prove

that E (p) = P

# UNIT-II

11. Find the Variance of the Sample Mean in Stratified Random Sampling.

12. Population of size is 660 divided in to 3 strata as follows:

| **Strata No.** | **I** | **II** | **III** |
|---|---|---|---|
| **Population size** | **150** | **250** | **260** |
| **S.D.** | **5** | **7** | **6** |

A stratified random sampling size of 100 is to be selected from the population. Find the sample size of Proportional allocation and Optimum allocation method.

**13.** In Stratified random sampling, for a specified cost function, $V(y_{st})$ is minimum if $\mathbf{n_i \,\alpha\, (N_i S_i) / \sqrt{C_i}}$

14. Comparison the Variance of Stratified random sampling under Proportional allocation and Optimum allocation.

15 A population of size 800 is divided in to 3 strata their sizes & Std.Deviations are given below.

| | **Strata** | | |
|---|---|---|---|
| | **I** | **II** | **III** |
| **Size** | **200** | **300** | **300** |
| **S.D.** | **6** | **8** | **12** |

A Stratified random sample of size 120 is to be drawn from population. Determine the sizes of samples from the three strata in case of

(i) Proportional Allocation (ii) Optimum Allocation.

16. Define Systematic sampling. Prove that Sample mean is unbiased estimate of the population mean in Systematic sampling.

17. Prove that Variance of the Systematic sample mean is given by

$$V(\bar{y}_{sys}) = S^2 (N-1)/N - S^2_{wsy}\, k(n-1)/N$$

18. Find the Efficiency of Systematic sampling over Simple random sampling.

19. Prove that Variance of the Systematic sample mean is given by

$$V(\bar{y}_{sys}) = (S^2/n)(nk-1)/nk[\, 1+(n-1)\rho \,]$$

Where **ρ** is the infraclass correlation co-efficient between the units of the same Systematic sample.

20. Prove that Variance of the Systematic sample mean is given by

$$\mathbf{V(\bar{y}_{sys}) = S^2_{wst}\ (k-1)/nk[\ 1+(n-1)\rho_{wst}\ ]}$$

## UNIT-III

21. Fit a linear trend to the following data by the least square's method. Verify that $\boldsymbol{\Sigma(y-y_e) = 0}$, Where $y_e$ is the corresponding trend value of y

| **Year** | **19 90** | **1992** | **1994** | **1996** | **1998** |
|---|---|---|---|---|---|
| **Prod.('000 units)** | **18** | **21** | **23** | **27** | **16** |

Also estimate the production for the year 1999.

22. The sales of a company (in million of rupees) for the year 1994-2001 are given below:

| **Year** | **1994** | **1995** | **1996** | **1997** | **1998** | **1999** | **2000** | **2001** |
|---|---|---|---|---|---|---|---|---|
| **Sales** | **550** | **560** | **555** | **585** | **540** | **525** | **545** | **585** |

(i) Find the liner trend equation.

(ii) Find the slope of the straight line.

23. The liner trend of sales of a company is Rs 6, 50,000 in 1995 and it rises by Rs 16,500 per year.

(i) Write down the trend equation

(ii) If a company knows that it sales in 1998 will be 10% below the forecasted trend sales, find its expected sales in 1998.

24. Fit a second degree parabola to the data.

| **X** | **1** | **2** | **3** | **4** | **5** |
|---|---|---|---|---|---|
| **Y** | **1090** | **1220** | **1390** | **1625** | **1915** |

25. The following is a monthly trend equation:

$Y_e = 20+2X$

(Origin: Jan.1992; X-unit= One month;Y unit= Month sales (in '000 Rupees)

Convert it in to an annual trend equation.

26. Fit an Exponential Curve of the form $\mathbf{U_t = ab^t}$ to the given data by using the method of least squares.

| Years | 1978 | 1979 | 1980 | 1981 | 1982 |
|---|---|---|---|---|---|
| Sales(‘000) | 10 | 12 | 13 | 10 | 8 |

27. Calculate (i) Three yearly (ii) Five yearly moving averages for the following data and comment on the results.

| Year | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Y | 242 | 250 | 252 | 249 | 253 | 255 | 251 | 257 | 260 | 265 | 262 |

28. Calculate the trend values by the method of moving average assuming a for a **four-yearly cycle**, from the data relating to sugar production in India:

| Year | Sugar Production | Year | Sugar Production |
|---|---|---|---|
| 1971 | 37.4 | 1977 | 48.4 |
| 1972 | 31.1 | 1978 | 64.6 |
| 1973 | 38.7 | 1979 | 58.4 |
| 1974 | 39.5 | 1980 | 38.6 |
| 1975 | 47.9 | 1981 | 51.4 |
| 1976 | 42.6 | 1982 | 84.4 |

29.The data below gives the average Quarterly prices of a commodity for 4 years.

| Year | Ist Quarter | IInd Quarter | IIIrd Quarter | IVth Quarter |
|---|---|---|---|---|
| 1980 | 40.3 | 44.8 | 46 | 48 |
| 1981 | 50.1 | 53.1 | 55.3 | 59.5 |
| 1982 | 47.2 | 60.1 | 52.1 | 55.2 |
| 1983 | 55.4 | 59 | 61.6 | 65.3 |

Calculate the Seasonal Indices by the method of simple averages.

30. Calculate Seasonal Indices by the method of Link Relatives to the following data.

| **Years** | **Price of Rice (in Rs for kg)** | | | |
|---|---|---|---|---|
| | **2001** | **2002** | **2003** | **2004** |
| **1** | **75** | **86** | **90** | **100** |
| **2** | **60** | **65** | **72** | **78** |
| **3** | **54** | **63** | **66** | **72** |
| **4** | **59** | **80** | **82** | **93** |

## UNIT-IV

31. You are given the values of sample mean X-bar and the range for ten samples of size 5 each. Draw mean and range charts and comment on the state of control of the process.

| **Sample No.** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** |
|---|---|---|---|---|---|---|---|---|---|---|
| **X-bar** | **43** | **49** | **37** | **44** | **45** | **37** | **51** | **46** | **43** | **47** |
| **R** | **5** | **6** | **5** | **7** | **7** | **4** | **8** | **6** | **4** | **6** |

You may use the following control charts constants:

**For n= 5. $A_2 = 0.58$ $D_3 = 0$ and $D_4 = 2.11$**

32. The following data give the measurements of the axles of bicycle wheels 12 samples were taken so that each sample contains the measurements of 4 axles. The measurement which was more than 5 inches are given here. Obtain trial control limits for X-bar and R –charts and comment whether the process is under control or not.

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **139** | **140** | **142** | **136** | **145** | **146** | **148** | **145** | **140** | **140** | **141** | **138** |
| **140** | **142** | **136** | **137** | **146** | **148** | **145** | **146** | **139** | **140** | **137** | **140** |
| **145** | **142** | **143** | **142** | **146** | **149** | **146** | **147** | **141** | **139** | **142** | **144** |
| **144** | **139** | **141** | **142** | **146** | **144** | **146** | **144** | **138** | **139** | **139** | **138** |

For **n=4 $A_2 = 0.73$ $D_3 = 0$ and $D_4 = 2.28$**

33. The following figures give the number of defectives in 20 samples, each containing 2,000 items.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **425** | **430** | **216** | **341** | **225** | **322** | **280** | **306** | **337** | **305** |
| **356** | **402** | **216** | **264** | **126** | **409** | **193** | **326** | **280** | **389** |

Calculate the values for central line and the control limits for p-chart .

34. An inspection of 10 samples of size 400 each from 10 lots revealed the following number of defective items.

**17 15 14 26 9 4 19 12 9 15**

Calculate control limits for the number of defective units. Plot the control limits and the observations and state whether the process is under control not.

35. The past records of a factory using quality control methods show that on the average 4 articles produced are defective out of a batch of 100.What is the maximum number of defective articles likely to be encountered in the batch of 100, when the production process is in a state of control?

36. Construct the 3-σ control limits for Standard Deviation Chart.

37. Distinguish clearly between control charts for variables and control charts attributes.

38. During an examination of equal length of cloth, the following are the number of defects observed:

**2 3 4 0 5 6 7 4 3 2**

Draw a control chart for the number of defects and comment whether the process is under control or not?

39. Construct the 3-σ control limits for U-Chart.

40. 10 computers were examined for quality control test. The number of defects for each computer is given below:

**2 3 6 7 4 2 3 4 1 1**

Draw a suitable control chart and comment.

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# SATAVAHANA UNIVERSITY, KARIMNAGAR.

## Department of Statistics

**CBCS Pattern with Semester System (w.e.f.2021-2022)**

**B.Sc (Statistics) -Semester -VI**

# Paper –VII(A) Applied Statistics - II

**(Design of Experiments, Vittal Statistics, Official Statistics and Index Numbers)**

**(Question Bank for Practical Examinations)**

## UNIT – I

1. Define ANOVA, Write the statement of Cochran's theorem and write any two assumptions of ANOVA.

2. Explain mathematical model of One-way classification

3. Explain the estimation of parameters in One-way classification.

4. What is Critical Deference and how it is calculated.

5. Three process A, B and C are tested to see whether their outputs are equalent. The following observations of outputs are made.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **A** | **10** | **12** | **13** | **11** | **10** | **14** | **15** | **13** |
| **B** | **9** | **11** | **10** | **12** | **13** | **-** | **-** | **-** |
| **C** | **11** | **10** | **15** | **14** | **12** | **13** | **-** | **-** |

Carry out the analysis of variance and state your conclusions.

**(Tab.Value :$F_{5\%, (2,16)}$ = 3.63)**

6. Find the expectations of sum of squares due to error in Two-way classification.

7. Define the terms: (i) Design of experiment.

(ii) Treatments.

(iii) Efficiency of a design.

8. Calculate the missing information in the following ANOVA table.

| Source of Variation | Degrees of freedom | Sum of Squares | Mean sum of squares | F-calculated |
|---|---|---|---|---|
| **Between Columns** | **-** | **-** | **756.67** | |
| **Between Rows** | **4** | **400** | **-** | |
| **Error** | **36** | **-** | **76.06** | |
| **TOTAL** | **49** | **-** | | |

9. There are four doctors, if they wish to test the five medicines, they applied these five treatments i.e. medicines on four patients each and the reading were given below:

| **Doctors** | **Observations of treatments (Medicines)** | | | | |
|---|---|---|---|---|---|
| | **A** | **B** | **C** | **D** | **E** |
| **1** | **12** | **16** | **18** | **21** | **24** |
| **2** | **16** | **25** | **20** | **23** | **28** |
| **3** | **14** | **20** | **23** | **16** | **20** |
| **4** | **15** | **24** | **23** | **25** | **36** |

Test the significance between the medicines and doctors at 1%level of significance.

**(Tab.Value: $F_{1\%,(4,12)}$ = 5.41,Tab.Value: $F_{1\%,(3,12)}$ = 5.95)**

10. The retail prices of a commodity in four cities A,B,C and D are given below Test whether the prices in four cities are significant or not. Analyse the data using one-way classification.

| **Cities** | **Prices of commodity in various shops** | | | | | | |
|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| **A** | **82** | **79** | **73** | **69** | **69** | **63** | **61** |
| **B** | **84** | **82** | **80** | **79** | **76** | **68** | **62** |
| **C** | **88** | **84** | **80** | **68** | **68** | **66** | **66** |
| **D** | **79** | **77** | **76** | **74** | **72** | **68** | **64** |

# UNIT-II

11. What are the principles of experimental design and explain in detail with R.A.Fisher's diagram.

12. Define Completely Randomised Design. Obtain the layout of the following design: A CRD with 4 treatments A, B ,C and D replicated **7, 6, 8 & 10** times.

13. Analyse the following Completely Randomised Design and give your conclusions:

| | | | |
|---|---|---|---|
| **A**<br>**10** | **B**<br>**12** | **C**<br>**12** | **B**<br>**8** |
| **B**<br>**12** | **C**<br>**14** | **A**<br>**10** | **C**<br>**11** |
| **A**<br>**8** | **B**<br>**12** | **A**<br>**8** | **C**<br>**10** |

14. Explain in detail Missing plot technique in C R D.

15. Obtain the expectations mean sum of squares due to error in R B D.

16. Find the missing observation in the following design and analyse the data.

| **Blocks** | **Treatments** | | | | | |
|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** |
| **1** | **18.5** | **15 .7** | **16.2** | **14.1** | **13** | **13.6** |
| **2** | **11.7** | **-** | **12.9** | **14.4** | **16.9** | **12.5** |
| **3** | **15.4** | **16.6** | **15.5** | **20.3** | **18.4** | **21.5** |
| **4** | **16.5** | **18.6** | **12.7** | **15.7** | **16.5** | **18** |

17. Find the Efficiency of R B D over C R D.

18. Define Latin Square Design and explain its mathematical model.

19. Fill up the blanks in the following ANOVA table:

| Source of Variation | Degrees of freedom | Sun of squares | Mean sun of squares |
|---|---|---|---|
| **Rows** | **3** | **-** | **106.26** |
| **Columns** | **3** | **115.81** | **-** |
| **Treatments** | **3** | **855.65** | **-** |
| **Error** | **-** | **139.37** | **-** |
| **TOTAL** | **14** | | |

20. Write the formulas for Relative Efficiency of L S D over R B D

When (i) Rows are taken as Blocks without Columns

(ii) Columns are taken as Blocks without Blocks.

## UNIT-III

21. Explain what are the various sources of Vital Statistics.

22. Compute crude death rates of the two populations A and B to the following data.

| Age group (Years) | A | | B | |
|---|---|---|---|---|
| | **Population** | **Deaths** | **Population** | **Deaths** |
| **Under 10** | **20000** | **600** | **12000** | **372** |
| **10-20** | **12000** | **240** | **30000** | **660** |
| **20-40** | **50000** | **1250** | **62000** | **1612** |
| **40-60** | **30000** | **1050** | **15000** | **325** |
| **Above 60** | **10000** | **500** | **3000** | **180** |

23. Define Life table and explain in detail the various columns of life table.

24. Calculate the Standardised Death Rates for the following data of two countries.

| **Age Group (in Years)** | **Death rate per 1,000** | | **Standardised Population (in Lakhs)** |
|---|---|---|---|
| | **Country –A** | **Country -B** | |
| **0-4** | **20** | **5** | **100** |
| **5-14** | **1** | **0.5** | **200** |
| **15-24** | **1.4** | **1** | **190** |
| **25-34** | **2** | **1** | **180** |
| **35-44** | **3.3** | **2** | **120** |
| **45-54** | **7** | **5** | **100** |
| **55-64** | **15** | **12** | **70** |
| **65-74** | **40** | **35** | **30** |
| **75 and above** | **120** | **110** | **10** |

25. Compute **(i) GFR (ii) A.S.F.R (iii) T.F.R** from the data given below:

| **Age group of Child bearing females** | **15-19** | **20-24** | **25-29** | **30-34** | **35-39** | **40-44** | **45-49** |
|---|---|---|---|---|---|---|---|
| **No. of Women (‘000)** | **16.0** | **16.4** | **15.8** | **15.2** | **14.8** | **15.0** | **14.5** |
| **Total Births** | **260** | **2244** | **1894** | **1320** | **916** | **280** | **14.5** |

Assume the proportion of female births is 46.2%

26. Given the age returns of the two ages **x= 9 and (x+1) = 10** years with a few life table values as $l_9$ **= 75,824,** $l_{10}$ **= 75,362,** $d_{10}$ **= 418,** $T_{10}$ **=49,53,195.** Find the complete life table for the ages of persons.

27. Fill in the blanks in the following life table given below:

| **Age:** | **x** | $l_x$ | $d_x$ | $p_x$ | $q_x$ | $L_x$ | $T_x$ | $e^0_x$ |
|---|---|---|---|---|---|---|---|---|
| | **4** | **95000** | **500** | **-** | **-** | **-** | **48,50,300** | **-** |
| | **5** | **-** | **400** | **-** | **-** | **-** | **-** | **-** |

28. From the data given below, calculate the GRR and NRR.

| **Age Group** | **No. of children born to 1000 women passing through the age group** | **Mortality rate (per 1000)** |
|---|---|---|
| **16-20** | **150** | **120** |
| **21-25** | **1500** | **180** |
| **26-30** | **2000** | **150** |
| **31-35** | **800** | **200** |
| **36-40** | **500** | **220** |
| **41-45** | **200** | **230** |
| **46-50** | **100** | **250** |

**Sex ratio being males: females = 52 : 48**

29. The values of $\mathbf{l_x}$ ; i.e. the no. of persons lying at age x are given below:

| **x** | **102** | **103** | **104** | **105** | **106** | **107** | **108** |
|---|---|---|---|---|---|---|---|
| $\mathbf{l_x}$ | **97** | **89** | **82** | **75** | **6** | **2** | **0** |

30. Define the terms: (i) Stationary Population (ii) Stable Population

(iii) Expectation of life (iv) Complete expectation of life.

## UNIT-IV

31. Explain CSO and write its two important publications.

32. Explain NSSO and write its two important publications.

33. Explain Agricultural Statistics.

34. Explain National Income and write its uses.

35. Explain the various methods to measure National Income.

36. Construct Laspeyre's and Paasch's index numbers for the year 1990 with 1980 as the base year to the following data.

| Commodity | Price | | Quantity | |
|---|---|---|---|---|
| | 1980 | 1990 | 1980 | 1990 |
| A | 10 | 12 | 12 | 15 |
| B | 7 | 5 | 15 | 20 |
| C | 5 | 9 | 24 | 20 |
| D | 16 | 14 | 5 | 5 |

37. Show that the Fisher's index number satisfy Time Reversal Test and Factor Reversal Test to the following data.

| Commodity | Price | | Quantity | |
|---|---|---|---|---|
| | 2010 | 2013 | 2010 | 2013 |
| A | 17 | 19 | 40 | 42 |
| B | 14 | 17 | 30 | 35 |
| C | 19 | 21 | 10 | 17 |
| D | 13 | 16 | 20 | 14 |
| E | 21 | 31 | 16 | 12 |
| F | 50 | 60 | 15 | 10 |

38. Compute Cost of Living Index Numbers (COLIN) by Aggregate Expenditure Method and Family Budget Method to the following data.

| Commodity | Quantity consumed | Price(Rs) in 2005 | Price(Rs) in 2005 |
|---|---|---|---|
| Rice | 50 kgs | 15 | 30 |
| Wheat | 4 kgs | 10 | 18 |
| Pulses | 3 kgs | 30 | 85 |
| Ghee | 1 kg | 47 | 73 |
| Jaggery | 2 kg | 12 | 18 |
| Sugar | 5 kg | 16 | 28 |
| Oil | 3 liters | 32 | 63 |
| Clothing | 10 meters | 15 | 27 |
| Fuel | 30 liters | 10 | 17 |
| House rent | - | 1200 | 2000 |

39 Two price index Series are given splicing the two series.

| Year | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|
| Series-I | 100 | 130 | 150 | 120 | | | |
| Series-II | | | | 100 | 130 | 160 | 140 |

40. The annual Wages (in Rs) of workers are given along with consumer Price Indices.

Find (i) The real wages (ii) The real wage indices.

| Year | 2000 | 2001 | 2002 | 2003 |
|---|---|---|---|---|
| Wages | 1800 | 2200 | 3400 | 3600 |
| Consumer Price Index | 100 | 170 | 300 | 320 |

**I Year B.Sc., I SEMESTER BIOCHEMSITRY**

# DSC – 1A

## Semester – I: BS 104; Practicals: Qualitative Analysis of Biomolecules

(1 Credits; 2 Hr/week)

1. Laboratory general safety procedures
2. Preparation of standard solutions ( Molar, Normal and percent solutions)
3. Determination of pKa values of amino acids by titration (Glycine)
4. Preparation of buffers (Acetate and Phosphate buffers)
5. Qualitative identification of Carbohydrates
6. Qualitative identification of Amino acids
7. Qualitative identification of Lipids

## References


1. Experimental Biochemistry-A student companion-Beedu Sashidhar Rao and Vijay Deshpande.
2. Laboratory Manual in Biochemistry- Jayaraman, J. Wiley Eastern

**I Year B.Sc., II SEMESTER BIOCHEMSITRY**

# DSC – 1B

## Semester – II: Paper-BS204; Practicals: Quantitative Analysis of Biomolecules

(1 Credits; 2 Hr/week)

1. Amino acid Estimation by Ninhydrin method
2. Protein Estimation by Biuret
3. Protein estimation by Folin`s Method
4. Estimation of Total Sugars by Anthrone Method
5. Estimation of Total Reducing Sugars by Dinitrosalicylate method
6. Estimation of Keto sugar by Roe`s resorcinol Method
7. Estimation of total sugars by Phenol-sulphuric acid method

## References


1. Experimental Biochemistry-A student companion-Beedu Sashidhar Rao and Vijay Deshpande.
2. Laboratory Manual in Biochemistry- Jayaraman, J. Wiley Eastern

**II Year B.Sc., III SEMESTER BIOCHEMSITRY**

# DSC – 1C

## Semester – III: Paper-BS305 (Practicals): ENZYMOLOGY

(1 Credits; 2Hr/week)

1. Assay of salivary α-amylase
2. Assay of β-amylase from sweet potatoes
3. Assay of urease
4. Assay of phosphatase
5. Determination of optimum temperature for amylase
6. Determination of optimum pH for amylase
7. Effect of Substrate concentration of amylase activity

### References


1. Experimental Biochemistry-A student companion-BeeduSashidharRao and Vijay Deshpande.
2. Laboratory Manual in Biochemistry- Jayaraman, J. Wiley Eastern
3. Enzyme Assays- A practical Approach: Eisenthal, R and Dawson,M.I., IRL Press.
4. Biochemical Methods- Sadasivam,S and Manickyam,A. New Age International Publishers.

**II Year B.Sc., IV SEMESTER BIOCHEMSITRY**

## DSC – 1 D

## Semester – IV: Paper-BS405 (Practicals): BIOCHEMICAL PREPARATIONS AND SEPARATIONS

**(1 Credits; 2Hr/week)**

1. Isolation of egg albumin from egg white.
2. Isolation of cholesterol from egg yolk.
3. Isolation of starch from potatoes.
4. Isolation of casein from milk.
5. Separation of amino acids by Paper chromatography
6. Separation of Plant pigments by TLC
7. Absorption maxima of colored substances- *p*-Nitrophenol, Methyl orange, BSA and DNA

### References

1. Experimental Biochemistry-A student companion-Beedu Sashidhar Rao and Vijay Deshpande.
2. Laboratory Manual in Biochemistry- Jayaraman, J. Wiley Eastern

# DSC – 1E

## Semester – V: Paper - BS 504 A (Practicals): Physiology, Nutrition and Clinical Biochemistry

### (1 Credits; 2Hr/week)

1. Estimation of hemoglobin in blood, Total count and Differential count – RBC and WBC
2. Urine analysis for albumin, sugars and ketone bodies.
3. Estimation of urinary creatinine.
4. Estimation of total serum cholesterol.
5. Estimation of vitamin C by 2, 6 - DCPIP method.
6. Determination of iodine value of oil.
7. Determination of peroxide value of oil.

## References


1. Experimental Biochemistry-A student companion-Beedu Sashidhar Rao and Vijay Deshpande.
2. Laboratory Manual in Biochemistry- Jayaraman, J. Wiley Eastern
3. Biochemical Methods- Sadasivam,S and Manickyam,A. New Age International Publishers

# DSE – 1 F

## Semester – VI: Paper - BS 603 A (Practicals) : Molecular Biology and Immunology

**(1 Credits; 2Hr/week)**

1. Isolation of DNA from onion/Plasmids
2. Determination of purity of nucleic acids by UV-spectrophotometric method.
3. Estimation of DNA by diphenylamine method.
4. Estimation of RNA by orcinol method.
5. Electrophoresis of nucleic acids and visualization by ethidium bromide staining.
6. Agglutination: A, B, AB and O blood groups and Rh
7. ODD and Sandwich ELISA

### References


1. Experimental Biochemistry-A student companion-Beedu Sashidhar Rao and Vijay Deshpande.
2. Laboratory Manual in Biochemistry- Jayaraman, J. Wiley Eastern
3. Biochemical Methods- Sadasivam,S and Manickyam,A. New Age International Publishers

**Model Paper Practical**
**SATAVAHANA UNIVERSITY**
**For All semesters**
**B.Sc Biochemistry**

**Duration: 2 hours** **Max Marks: 25**

1. Write the principles for any two experiments 5 marks
2. Major experiment 10 marks
3. Minor experiment 5 marks
4. Viva-voce and record 5 marks

**NO OF CREDITS FOR EACH PAPER: 01**
**TOTAL CREDITS : 06**

# B.Sc. PHYSICS PRACTICAL SYLLABUS UNDER CBCS SCHEME OF INSTRUCTION

| Semister | Paper | Instructions hours/week | Marks | credits |
|---|---|---|---|---|
| I | Mechanics & oscillations | 3 | 25 | 1 |
| II | Thermal physics | 3 | 25 | 1 |
| III | Electro magnetic theory | 3 | 25 | 1 |
| IV | Waves &optics | 3 | 25 | 1 |
| V | Modern Physics | 3 | 25 | 1 |
| VI | Electronics | 3 | 25 | 1 |

Total credits = 6

**Paper – I: Mechanics and Oscillations Practicals**
**(DSC-1: Compulsory)**

1. Measurement of errors – Simple Pendulum.
2. Calculation of slope and intercept of Y= mX +C graph by theoretical method (simple pendulum experiment)
3. Study of a compound pendulum- determination of 'g' and 'k'.
4. Y' by uniform Bending
5. Y by Non-uniform Bending.
6. Moment of Inertia of a fly wheel.
7. Rigidity modulus by Torsion Pendulum.
8. Determination of surface tension of a liquid through capillary rise method.
9. Determination of Surface Tension of a liquid by any other method.
10. Determination of Viscosity of a fluid.
11. Observation of Lissajous figures from CRO- Frequency ratio. Amplitude and phase difference of two waves.
12. Study of oscillations of a mass under different combination of springs- Series and parallel
13. Study of Oscillations under Bifilar suspension- Verification of axis theorems

**Paper – II: Thermal Physics Practicals**
**(DSC-2: Compulsory)**

1. Co-efficient of thermal conductivity of a bad conductor by Lee's method.
2. Measurement of Stefan's constant.
3. Specific heat of a liquid by applying Newton's law of cooling correction.

4. Heating efficiency of electrical kettle with varying voltages.
5. Calibration of thermo couple
6. Cooling Curve of a metallic body
7. Resistance thermometer
8. Thermal expansion of solids
9. Study of conversion of mechanical energy to heat.
10. Determine the Specific of a solid ( graphite rod )

## Paper – III: Electromagnetic Theory Practicals
## (DSC-3: Compulsory)

1. To verify the Thevenin Theorem
2. To verify Norton Theorem
3. To verify Superposition Theorem
4. To verify maximum power transfer theorem.
5. To determine a small resistance by Carey Foster's bridge.
6. To determine the (a) current sensitivity, (b) charge sensitivity, and (c) CDR of a B.G.
7. To determine high resistance by leakage method.
8. To determine the ratio of two capacitances by De Sauty's bridge.
9. To determine self-inductance of a coil by Anderson's bridge using AC.
10. To determine self-inductance of a coil by Rayleigh's method.
11. To determine coefficient of Mutual inductance by absolute method.
12. LR circuit
13. RC circuit
14. LCR series circuit
15. LCR parallel circuit

**Paper – IV: Waves and Optics Practicals**
**(DSC-4: Compulsory)**

1. Thickness of a wire using wedge method.
2. Determination of wavelength of light using Biprism.
3. Determination of Radius of curvature of a given convex lens by forming Newton's rings.
4. Resolving power of grating.
5. Study of optical rotation-polarimeter.
6. Dispersive power of a prism
7. Determination of wavelength of light using diffraction grating minimum deviation method.
8. Wavelength of light using diffraction grating – normal incidence method.
9. Resolving power of a telescope.
10. Refractive index of a liquid and glass (Boys Method).
11. Pulfrich refractometer – determination of refractive index of liquid.
12. Wavelength of Laser light using diffraction grating.
13. Verification of Laws of a stretched string (Three Laws).
14. Velocity of Transverse wave along a stretched string
15. Determination of frequency of a bar- Melde‟s experiment

## Paper- V(A) : Modern Physics Practicals
**(DSE-1: Elective)**

1. Measurement of Planck’s constant using black body radiation and photo-detector
2. Photo-electric effect: photo current versus intensity and wavelength of light; maximum energy of photo-electrons versus frequency of light
3. To determine the Planck’s constant using LEDs of at least 4 different colors.
4. To determine the ionization potential of mercury.
5. To determine the absorption lines in the rotational spectrum of Iodine vapour.
6. To determine the value of e/m by (a) Magnetic focusing or (b) Bar magnet.
7. To setup the Millikan oil drop apparatus and determine the charge of an electron.
8. To show the tunneling effect in tunnel diode using I-V characteristics.
9. To determine the wavelength of laser source using diffraction of single slit.
10. To determine the wavelength of laser source using diffraction of double slits.
11. To determine (1) wavelength and (2) angular spread of He-Ne laser using plane diffraction grating
12. To determine the value of e/m for electron by long solenoid method.
13. Photo Cell – Determination of Planck’s constant.
14. To verify the inverse square law of radiation using a photo-electric cell.
15. To find the value of photo electric work function of a material of the cathode using a photo-electric cell.
16. Measurement of magnetic field – Hall probe method.
17. To determine the dead time of a given G.M. tube using double source.
18. Hydrogen spectrum – Determination of Rydberg’s constant
19. Energy gap of intrinsic semi-conductor
20. G. M. Counter – Absorption coefficients of a material.
21. To draw the plateau curve for a Geiger Muller counter.
22. To find the half-life period of a given radioactive substance using a G.M. Counter.

### Paper-VI(A) : Electronics Practicals

**(DSE-2: Elective**)

1. Construction of logic gates (AND, OR, NOT, gates ) with discrete components– Truth table Verification
2. AND, OR, NOT – gates constructions using universal gates – Verification of truth tables.
3. Constructionof NAND and NOR gates with discrete components and truth table verification
4. Characteristics of a Transistor in CE configuration
5. R.C. coupled amplifier – frequency response.
6. Verification of De Morgan’s Theorem.
7. Zener diode V-I characteristics.
8. P-n junction diode V- I characteristics.
9. Zener diode as a voltage regulator
10. Construction of a model D.C. power supply
11. R C phase shift Oscillator –determination of output frequency

# Model question papers:

## Paper – I: Mechanics and Oscillations Practicals

1. Measure of errors – Simple Pendulum.
2. Calculate of slope and intercept of Y= mX +C graph by theoretical method (simple pendulum experiment)
3. Determine 'g' and 'k' of a compound pendulum.
4. Determine Y' by uniform Bending
5. Determine Y by Non-uniform Bending.
6. Determine Moment of Inertia of a fly wheel.
7. Determine Rigidity modulus by Torsion Pendulum.
8. Determine surface tension of a liquid through capillary rise method.
9. Determine Surface Tension of a liquid by any other method.
10. Determine Viscosity of a fluid.
11. Observation of Lissajous figures from CRO- Frequency ratio. Determine Amplitude and phase difference of two waves.
12. Study the oscillations of a mass under different combination of springs- Series and parallel
13. Study the Oscillations under Bifilar suspension- Verification of axis theorems

**Paper – II: Thermal Physics Practicals**

1. Determine Co-efficient of thermal conductivity of a bad conductor by Lee's method.
2. Measure Stefan's constant.
3. Determine Specific heat of a liquid by applying Newton's law of cooling correction.
4. Determine Heating efficiency of electrical kettle with varying voltages.
5. Calibrate of thermo couple
6. Calibrate Cooling Curve of a metallic body
7. Determine Resistance thermometer
8. Determine Thermal expansion of solids
9. Determine conversion of mechanical energy to heat.
10. Determine the Specific of a solid ( graphite rod )

## Paper – III: Electromagnetic Theory Practicals

1. Verify the Thevenin Theorem
2. Verify Norton Theorem
3. Verify Superposition Theorem
4. Verify maximum power transfer theorem.
5. Determine a small resistance by Carey Foster's bridge.
6. Determine the (a) current sensitivity, (b) charge sensitivity, and (c) CDR of a B.G.
7. Determine high resistance by leakage method.
8. Determine the ratio of two capacitances by De Sauty's bridge.
9. Determine self-inductance of a coil by Anderson's bridge using AC.
10. Determine self-inductance of a coil by Rayleigh's method.
11. Determine coefficient of Mutual inductance by absolute method.
12. Verify LR circuit
13. Verify RC circuit
14. Verify LCR series circuit
15. Verify LCR parallel circuit

**Paper – IV: Waves and Optics Practicals**

1. Find the thickness of a wire using wedge method.
2. Determine wavelength of light using Biprism.
3. Determine Radius of curvature of a given convex lens by forming Newton's rings.
4. Resolving power of grating.
5. Study the optical rotation-polarimeter.
6.Determine Dispersive power of a prism
7. Determine wavelength of light using diffraction grating minimum deviation method.
8. Find the wavelength of light using diffraction grating – normal incidence method.
9. Find Resolving power of a telescope.
10. Determine Refractive index of a liquid and glass (Boys Method).
11. Determine Pulfrich refractometer – determination of refractive index of liquid.
12. Determine Wavelength of Laser light using diffraction grating.
13. Verify Laws of a stretched string (Three Laws).
14. Determine Velocity Transverse wave along a stretched string
15. Determination of frequency of a bar- Melde's experiment

## Paper- V(A) : Modern Physics Practicals

1. Measurement of Planck's constant using black body radiation and photo-detector
2. Determine Photo-electric effect: photo current versus intensity and wavelength of light; maximum energy of photo-electrons versus frequency of light
3. Determine the Planck's constant using LEDs of at least 4 different colors.
4. Determine the ionization potential of mercury.
5. Determine the absorption lines in the rotational spectrum of Iodine vapour.
6. Determine the value of e/m by (a) Magnetic focusing or (b) Bar magnet.
7. Setup the Millikan oil drop apparatus and determine the charge of an electron.
8. Show the tunnelling effect in tunnel diode using I-V characteristics.
9. Determine the wavelength of laser source using diffraction of single slit.
10. Determine the wavelength of laser source using diffraction of double slits.
11. Determine (1) wavelength and (2) angular spread of He-Ne laser using plane diffraction grating
12. Determine the value of e/m for electron by long solenoid method.
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15. Find the value of photo electric work function of a material of the cathode using a photo-electric cell.
16. Measurement of magnetic field – Hall probe method.
17. Determine the dead time of a given G.M. tube using double source.
18. Hydrogen spectrum – Determination of Rydberg's constant
19. Energy gap of intrinsic semi-conductor
20. G. M. Counter – Absorption coefficients of a material.
21. Draw the plateau curve for a Geiger Muller counter.
22. Find the half-life period of a given radioactive substance using a G.M. Counter.

## Paper-VI(A) : Electronics Practicals

1. Construct logic gates (AND, OR, NOT, gates ) with discrete components and Verify truth tables.

2. construct and verify AND, OR, NOT – gates using universal gates.

3. Construct and verify NAND and NOR gates

4. Determine Characteristics of a Transistor in CE configuration

5. Determine R.C. coupled amplifier – frequency response.

6. Verify De Morgan's Theorem.

7. construct and verify Zener diode V-I characteristics.

8. draw P-n junction diode V- I characteristics.

9. show that Zener diode as a voltage regulator

10. Construct a model D.C. power supply

11. Determine output frequency of R C phase shift Oscillator