CBCS SCHEME

USN

18MAT41

Fourth Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025
Complex Analysis, Probability and Statistical Methods

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Show that $w = f(z) = z + e^z$ is analytic and hence find $\frac{dw}{dz}$. **(06 Marks)**

b. Derive Cauchy's – Riemann equations in polar form. **(07 Marks)**

c. If $u = x^3 - 3xy^2 + 3x^2 - 3y^2 + 1$ then find analytic function $f(z) = u + iv$. **(07 Marks)**

OR

2 a. Show that the real and imaginary parts of an analytic function $f(z) = u + iv$ are harmonic. **(06 Marks)**

b. If f(z) is an analytic function then show that

$$\left[\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right]|f(z)|^2 = 4|f'(z)|^2$$ **(07 Marks)**

c. If $u = \left(r + \frac{1}{r}\right)\cos\theta$ then find the corresponding analytic function $f(z) = u + iv$. **(07 Marks)**

Module-2

3 a. State and prove Cauchy's integral formula. **(06 Marks)**

b. Discuss the conformal transformation $w = f(z) = z^2$. **(07 Marks)**

c. Find the bilinear transformation which maps the points $z = 1, i, -1$ into the points $w = i, 0, -i$. **(07 Marks)**

OR

4 a. Evaluate $\int_C z^2\, dz$ along the curve made up of two line segments, one from $z = 0$ to $z = 3$ and another from $z = 3$ to $z = 3 + i$ **(06 Marks)**

b. Evaluate $\int_C \frac{e^{2z}}{(z+1)(z-2)}\, dz$, where c is the circle $|z| = 3$. **(07 Marks)**

c. Find the bilinear transformation which maps the points $z = -1, 0, 1$ into the points $w = 0, i, 3i$. **(07 Marks)**

Module-3

5 a. The probability distribution of a random variable X is given by the following table:

$X(=x_i)$	-3	-2	-1	0	1	2	3
P(X)	k	2k	3k	4k	3k	2k	k

Find (i) The value of k, (ii) $P(x \le 1)$, (iii) $P(-1 < x \le 2)$ **(06 Marks)**

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

VTU-03-02-2025 01:15:27pm KS - KS - KS

b. The probability that a pen manufactured by a factory be defective is 1/10. If 12 such pens are manufactured, what is the probability that (i) Exactly 2 are defective (ii) Atleast 2 are defective (iii) None of them are defective. **(07 Marks)**

c. The length of telephone conversation in a booth has been an exponential distribution and found on an average to be 5 minutes. Find the probability that a random call made from this booth (i) Ends less than 5 minutes (ii) Between 5 and 10 minutes. **(07 Marks)**

OR

6 a. The probability density function of a random variable X is

$$f(x) = \begin{cases} Kx^2 & , \quad 0 < x < 3 \\ 0 & , \quad \text{otherwise} \end{cases}$$

Find (i) The value of K (ii) $P(1 < x < 2)$ (iii) $P(x \le 1)$ **(06 Marks)**

b. In a certain town the duration of a shower is exponentially distributed with mean 5 minutes what is the probability that a shower will last for (i) Ten minutes or more (ii) Less than Ten minutes (iii) Between 10 and 12 minutes. **(07 Marks)**

c. The marks of 1000 students in an examination follows a normal distribution with mean 70 and standard deviation 5. Find the number of students whose marks will be (i) less than 65, (ii) more than 75 (iii) 65 to 75. [$\phi(1) = 0.3413$] **(07 Marks)**

Module-4

7 a. Compute the rank correlation coefficient for the following data:

x	68	64	75	50	64	80	75	40	55	64
y	62	58	68	45	81	60	68	48	50	70

(06 Marks)

b. Find a best fitting straight line $y = ax + b$ for the data below:

x	1	3	4	6	8	9	11	14
y	1	2	4	4	5	7	8	9

(07 Marks)

c. Obtain the lines of regression and hence find the coefficient of correlation for the data below:

x	1	2	3	4	5	6	7
y	9	8	10	12	11	13	14

(07 Marks)

OR

8 a. If θ is the acute angle between the lines of regression then show that

$$\tan\theta = \frac{\sigma_x \sigma_y}{\sigma_x^2 + \sigma_y^2}\left[\frac{1-r^2}{r}\right]$$

(06 Marks)

b. Find a best fitting second degree parabola of the form $y = ax^2 + bx + c$ for the data below:

x	1	2	3	4	5
y	10	12	13	16	19

(07 Marks)

c. Find the coefficient of correlation for the following data:

x	10	14	18	22	26	30
y	18	12	24	06	30	36

(07 Marks)

Module-5

9 a. The joint probability of discrete random variables X and Y is given below:

X \ Y	1	3	9
2	1/8	1/24	1/12
4	1/4	1/4	0
6	1/8	1/24	1/12

Determine (i) Marginal distribution of X and Y. (ii) Covariance and correlation of X and Y. **(06 Marks)**

b. A survey was conducted in a slum locality of 2000 families by selecting a sample of size 800, it was revealed that 180 families were illiterates. Find the probable limits of the illiterates families in the population of 2000 at 1% level of significance. **(07 Marks)**

c. A group of 10 boys fed at diet A and another group of 08 boys fed on another diet B for a period of 06 months record the following increase in weights in pounds.

Diet A	05	06	08	01	12	04	03	09	06	10
Diet B	02	03	06	08	10	01	02	08	-	-

Test whether diet A and B differ significantly regarding their effect on increase in weight. [$t_{0.05} = 2.12$] **(07 Marks)**

OR

10 a. Explain the terms :
(i) Null hypothesis
(ii) Type-I and Type-II errors
(iii) Level of significance. **(06 Marks)**

b. A certain stimulus administered to each of the 12 patients resulted in the following change in blood pressure: 5, 2, 8, −1, 3, 0, 6, −2, 1, 5, 0, 4
Can it be concluded that the stimulus will increase the blood pressure? [$t_{0.05} = 2.201$] **(07 Marks)**

c. A sample analysis of examination, result of 500 students was made, it was found that 220 students had failed, 170 had secured third class, 90 had secured second class, 20 had secured first class. Do these figures support the general examination result which is in the ratio 4 : 3 : 2 : 1 for the respective categories? [$\chi^2_{0.05} = 7.81$]. **(07 Marks)**

* * * * *

CBCS SCHEME

USN | | | | | | | | | |

18MATDIP41

Fourth Semester B.E. Degree Examination, Dec.2024/Jan.2025
Additional Mathematics – II

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Find the rank of the matrix $\begin{pmatrix} 1 & 3 & -1 & 2 \\ 0 & 11 & -5 & 3 \\ 2 & -5 & 3 & 1 \\ 4 & 1 & 1 & 5 \end{pmatrix}$ by reducing to echelon form. **(06 Marks)**

b. Solve the system of equations by Gauss elimination method:
$x + y + z = 9$
$x - 2y + 3z = 8$
$2x + y - z = 3$ **(07 Marks)**

c. Find the eigen values and eigen vectors of the matrix $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$. **(07 Marks)**

OR

2 a. Find the rank of the following matrix by applying elementary row transformation
$\begin{bmatrix} 2 & 3 & -1 & -1 \\ 1 & -1 & -2 & -4 \\ 3 & 1 & 3 & -2 \\ 6 & 3 & 0 & -7 \end{bmatrix}$ **(06 Marks)**

b. Solve the following system of linear equations by Gauss elimination method:
$x + 2y + z = 3,\ 2x + 3y + 3z = 10,\ 3x - y + 2z = 13$ **(07 Marks)**

c. Find the eigen values and eigen vectors of the matrix $A = \begin{bmatrix} 2 & 0 & 1 \\ 0 & 2 & 0 \\ 1 & 0 & 2 \end{bmatrix}$ **(07 Marks)**

Module-2

3 a. A function f(x) is given by the following table

x	0	1	2	3	4	5	6
f(x)	176	185	194	203	212	220	229

Obtain the value of f(x) at x = 0.6 by using appropriate interpolation formula. **(06 Marks)**

b. The equation $x^3 - 3x + 4 = 0$ has one real root between -2 and -3. Find the root to three places of decimals by using Regula-Falsi method. **(07 Marks)**

c. Using Simpson's 1/3[rd] rule, evaluate $\int_0^1 e^{-x^2}$ by dividing the interval (0, 1) into 10 sub intervals, (h = 0.1). **(07 Marks)**

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

VTU-28-02-2025 01:30:54pm - KS - KS - KS

OR

4 a. Find f(2.5) by using Newton's backward interpolation formula given that f(0) = 7.4720, f(1) = 7.5854, f(2) = 7.6922, f(3) = 7.8119, f(4) = 7.9252. **(06 Marks)**

b. Find the real root of the equation $xe^x - 2 = 0$, correct to three decimal places by using Newton Raphson method. **(07 Marks)**

c. Evaluate $\int_0^1 \frac{x\,dx}{1+x^2}$ by Weddle's rule taking seven ordinates. **(07 Marks)**

Module-3

5 a. Solve : $\frac{d^3y}{dx^3} - 6\frac{d^2y}{dx^2} + 11\frac{dy}{dx} - 6y = 0$ **(06 Marks)**

b. Solve : $(D^2 + 7D + 12)y = \cosh x$ **(07 Marks)**

c. Solve : $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = \cos 2x$ **(07 Marks)**

OR

6 a. Solve : $(D^3 - 4D^2 + 5D - 2)y = 0$ **(06 Marks)**

b. Solve : $\frac{d^2y}{dx^2} - 4y = \cosh(2x-1) + 3^x$ **(07 Marks)**

c. Solve : $(D^2 - 4D + 3)y = \sin 3x.\cos 2x$ **(07 Marks)**

Module-4

7 a. Form the partial differential equation by eliminating the arbitrary constants 'a' and 'b' $z = (x^2 + a)(y^2 + b)$ **(06 Marks)**

b. Form the partial differential equation by eliminating arbitrary functions "f" from $z = f\left(\frac{xy}{z}\right)$. **(07 Marks)**

c. Solve $\frac{\partial^2 z}{\partial x \partial y} = \sin x.\sin y$, given that $\frac{\partial z}{\partial y} = -2\sin y$ when x = 0 and z = 0 when y is an odd multiple of $\pi/2$. **(07 Marks)**

OR

8 a. Form the partial differential equation by eliminating arbitrary function 'f' from the function $f(xy + z^2, x + y + z) = 0$ **(06 Marks)**

b. Form partial differential equation by eliminating arbitrary functions 'f' and 'g' from the function $z = y\,f(x) + x\,g(y)$ **(07 Marks)**

c. Solve $\frac{\partial^2 z}{\partial x^2} + z = 0$, given that when x = 0, $z = e^y$ and $\frac{\partial z}{\partial x} = 1$. **(07 Marks)**

Module-5

9 a. A bag contains 8-white and 6-red balls. Find the probability of drawing two balls of the same colour. **(06 Marks)**

b. Three machines A, B, C produces 50%, 30%, 20% of the items in a factory. The percentage of defective outputs are 3, 4, 5. If an item is selected at random, what is the probability that it is defective? What is the probability that it is for A? **(07 Marks)**

c. A can hit a target 3-times in 5 shots, B – 2 times in 5 shots and C – 3 times in 4 shots. They fire a volley. What is the probability that i) two shots hit ii) atleast two shots hit? **(07 Marks)**

OR

10 a. State and prove Baye's theorem. **(06 Marks)**

b. State the axiomatic definition of probability. For any two arbitrary events A and B, prove that $P(A \cup B) = P(A) + P(B) - P(A \cap B)$. **(07 Marks)**

c. If A and B are two events with $P(A) = \frac{1}{2}$, $P(B) = \frac{1}{3}$, $P(A \cap B) = \frac{1}{4}$. Then find $P(A/B)$, $P(B/A)$, $P\left(\overline{A}/\overline{B}\right)$, $P\left(\overline{B}/\overline{A}\right)$ and $P\left(A/\overline{B}\right)$. **(07 Marks)**

* * * * *

VTU - 28-02-2025 01:45:00pm - KS - KS - KS - KS - KS - KS - KS - KS - KS - 28-02-2025 01:30:54pm - KS - KS - KS - KS - KS - KS

CBCS SCHEME

USN | | | | | | | | | | |

18CS42

Fourth Semester B.E. Degree Examination, Dec.2024/Jan.2025
Design and Analysis of Algorithm

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. Define Algorithm. Explain asymptotic notations Big O, Big Omega and Big theta notations with example. **(10 Marks)**

b. Explain general plan of mathematical analysis of non-recursive algorithms with example. **(10 Marks)**

OR

2 a. Illustrate mathematical analysis of recursive algorithm for towers of hanoii. **(08 Marks)**

b. Define time and space complexity. Explain important problem types. **(12 Marks)**

Module-2

3 a. Write the algorithm for recursive binary search and find efficiency for all three cases. **(10 Marks)**

b. Explain divide and conquer technique. Write an algorithm for merge sort. **(10 Marks)**

OR

4 a. Illustrate the tracing of quick sort algorithm for the following set of numbers :
50, 10, 25, 30, 15, 70, 35, 55 **(10 Marks)**

b. Explain decrease and conquer technique. Illustrate the topological sorting for the following graph : **(10 Marks)**

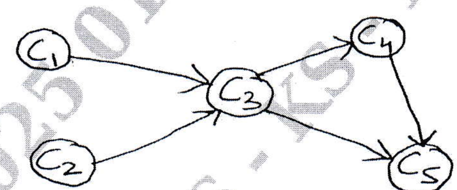

Fig. Q4 (b)

Module-3

5 a. Explain the concept of greedy method. Write a Kruskal's algorithm to find minimum cost spanning tree. **(10 Marks)**

b. Solve the following single source shortest path problem assuming vertex '1' as the source. **(10 Marks)**

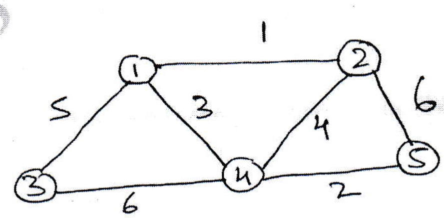

Fig.Q5 (b)

VTU-06-02-2025 01:16:25pm KS - KS - KS - KS
KS - KS - KS - KS 06-02-2025 01:26:15pm KS - KS

OR

6 a. Sort the given list of numbers using heap sort : 2, 9, 7, 6, 5, 8 **(10 Marks)**

b. Construct a Huffman tree and resulting code word for the following :

Char	A	B	C	D	E	-
Probability	0.5	0.35	0.5	0.1	0.4	0.2

Encode the text DAD. Decode the text whose encode is 1100110110. **(10 Marks)**

Module-4

7 a. Explain the concept of dynamic programming. Using Floy'ds algorithm. Solve the all pair shortest problem for the graph whose weight matrix is given below :

$$\begin{bmatrix} 0 & \infty & 3 & \infty \\ 2 & 0 & \infty & \infty \\ \infty & 7 & 0 & 1 \\ 6 & \infty & \infty & 0 \end{bmatrix}$$

(12 Marks)

b. Write multistage graph algorithm to forward approach. **(08 Marks)**

OR

8 a. Write an algorithm for Bellman-Ford algorithm. **(10 Marks)**

b. Solve the following instance of Knapsack problem using dynamic programming. Knapsack capacity is 5. **(10 Marks)**

Item	1	2	3	4
Weight	2	1	3	2
Value	$12	$10	$20	$15

Module-5

9 a. Explain backtracking method. Illustrate 4-queens problem using backtracking method. And also write another solution. **(10 Marks)**

b. Solve subset sum problem for the following example, S = {3, 5, 6, 7} and d = 15. Construct a state space tree. **(10 Marks)**

OR

10 a. Explain branch and bound method. Solve assignment problem for the following :

	J_1	J_2	J_3	J_4
Person a	9	2	7	8
Person b	6	4	3	7
Person c	5	8	1	8
Person d	7	6	9	4

(10 Marks)

b. With the help of a state space tree, solve following instance of the knapsack problem the FIFO branch and bound method. The knapsack capacity is 15.

Item	1	2	3	4
Weights	2	4	6	9
Values	10	10	12	18

(10 Marks)

* * * * *

CBCS SCHEME

USN | | | | | | | | | |

18CS45

Fourth Semester B.E. Degree Examination, Dec.2024/Jan.2025
Object Oriented Concepts

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Write the difference between procedure oriented program and object oriented program. **(04 Marks)**
b. Explain the various features of OOC. **(08 Marks)**
c. What is constructor? List the different types of constructors and explain. **(08 Marks)**

OR

2 a. What is function overloading? Write C++ program to define three overload function area( ) to find area of circle, triangle and rectangle. **(10 Marks)**
b. Why friend function is required? Write a program to add two numbers using friend function. **(10 Marks)**

Module-2

3 a. Discuss the label break and continue with example. **(05 Marks)**
b. Explain the concepts of array in java with example. **(07 Marks)**
c. List and explain Java Buzz words. **(08 Marks)**

OR

4 a. Explain different access specifiers in java with example. **(10 Marks)**
b. What is nested class? Explain how nested class can be defined as private of enclosing class with example. **(10 Marks)**

Module-3

5 a. What is an exception? With syntax explain exception handling mechanism. **(10 Marks)**
b. Define package. What are the steps involved in creating user defined package with an example. **(10 Marks)**

OR

6 a. Compare construct method overloading and overriding with example. **(10 Marks)**
b. What are the uses of inheritance? Explain inheriting data members and method with a program. **(10 Marks)**

Module-4

7 a. What is thread? Explain two ways of creating a thread in JAVA with eg. **(10 Marks)**
b. Explain synchronization using synchronized methods. **(10 Marks)**

OR

8 a. What is an applet? Explain the skeleton of an applet. Enlist applet tags. **(10 Marks)**
b. What is meant by deadlock? How to avoid deadlock? Give example. **(10 Marks)**

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

VTU-19-02-2025 01:16:17pm KS - KS - KS - KS - KS
19-02-2025 04:31:03pm KS - KS - KS - KS - KS

Module-5

9 a. Explain the HTML applet with syntax and example. **(10 Marks)**
b. Explain advantages of swing over AWT and two key features of swings. **(10 Marks)**

OR

10 a. Explain a simple swing application with program. **(10 Marks)**
b. Explain with syntax:
i) JScrollpane
ii) Jlist
iii) ImageIcon
iv) JTextField
v) Jtabbedpane. **(10 Marks)**

* * * * *

VTU-19-02-2025 01:16:17pm
KS - KS - KS - KS - KS - KS - KS - KS - KS
19-02-2025 01:31:03pm
KS - KS - KS - KS - KS - KS - KS - KS - KS