(Please write your Exam Roll No.) Exam Roll No. .....

END TERM EXAMINATION

SECOND SEMESTER [BCA] JULY 2023

Paper Code: BCA-102 **Subject: Applied Mathematics**

(Batch 2021 Onwards)

Time: 3 Hours **Maximum Marks: 75**

Note: Attempt five questions in all including Q. No.1 which is compulsory. Select one question from each unit. Scientific Calculator is allowed.

Q1 **Answer the following:-**

(a) Determine the binomial distribution for which mean is 4 and variance is 3. **(2.5)**

(b) The probabilities that students A, B, C and D solve a problem are 1/3, 2/5, 1/5 and 1/4, respectively. If all of them try to solve the problem, what is the probability that the problem will be solved? **(2.5)**

(c) Construct forward difference table from the values of x and y given below: **(2.5)**

X	0	1	2	3	4	5
y	5	11	22	18	27	2

(d) Prove that $\Delta\nabla = \Delta - \nabla$, where Δ and ∇ are forward and backward difference operators. **(2.5)**

(e) Using Lagrange interpolation, find the unique polynomial of degree 2, such that f(0) = 1, f(1) = 3, f(3) = 55. **(2.5)**

(f) What do you mean by Numerical Integration? **(2.5)**

(g) Calculate $\int_1^5 Sin\, x\, dx$ correct to four decimal places with h = 1. **(2.5)**

(h) Define basic feasible solution in Linear Programming Problem (LPP). **(2.5)**

(i) Write a note on unbounded solution of LPP. **(2.5)**

(j) Write a note on slack and surplus variables in LPP. **(2.5)**

UNIT-I

Q2 (a) An insurance company insured 2000 scooter drivers, 4000 car drivers and 6000 truck drivers. The probability of an accident involving a scooter driver, car driver and truck driver is 0.01, 0.03 and 0.15 respectively. One of the insured person meets with an accident. What is the probability that he is a truck driver? **(6.5)**

(b) If X is a Poisson variate such that P(X=2) = 9P(X=4) + 90P(X=6). Find the mean and variance of X. **(6)**

Q3 (a) If the heights of 500 students are normally distributed with mean 68 inches and standard deviation 3 inches. How many students have heights (i) greater than 72 inches (ii) less than equal to 64 inches (iii) between 65 and 71 inches? Given P(Z≤1.33)=0.4082, P(Z≤1)=0.3413. **(6.5)**

(b) A continuous random variable X has probability density function. **(6)**

$$\begin{cases} \frac{k}{1+x^2}, & -\infty < x < \infty \\ 0, & otherwise \end{cases}$$

Determine the value of k and evaluate $P(X \geq 0)$.

P.T.O.

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P1/3

UNIT-II

Q4 (a) Find the missing value of the following table. Explain why the result differs from 16? **(6)**

X	1	2	3	4	5	6	7
y	2	4	8	-	32	64	128

(b) Find a real root of the equation $x^3 - x = 1$ using False Position method upto fifth iteration. **(6.5)**

Q5 (a) Obtain a formula to calculate cube root of a natural number N and use it to evaluate cube root of 28. **(6)**

(b) Estimate by suitable method of interpolation the number of persons whose daily income is Rs. 19 but not exceed Rs. 25 from the following data. **(6.5)**

Income (In Thousands)	0-9	9-19	19-28	28-37	37-46
No. of persons	50	70	203	406	304

UNIT-III

Q6 (a) Find the LU decomposition of the matrix $A = \begin{bmatrix} 3 & 2 & 7 \\ 2 & 3 & 1 \\ 3 & 4 & 1 \end{bmatrix}$. **(6.5)**

(b) From the following table of values of x and y, obtain dy/dx at x = 4 and d^2y/dx^2 at x = 5. **(6)**

x	0	1	2	3	4	5
y	4	8	15	7	6	2

Q7 (a) Solve the following system using the Gauss – Seidel iterative method. Perform three iterations only. **(6.5)**

$$5x - y + 3z = 3$$
$$4x + 7y - 2z = 2$$
$$6x - 3y + 9z = 9$$

(b) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ by using Simpson's 1/3 rule and hence obtain the approximate value of π. **(6)**

UNIT-IV

Q8 Solve the following linear programming problem by using simplex method: **(12.5)**

Min Z = x1 + 2x2 + 3x3

subject to

2x1 - x2 + x3 ≥ 4

x1 + x2 + 2x3 ≤ 8

x2 - x3 ≥ 2

and x1,x2,x3 ≥ 0

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Q9 (a) Find the optimal solution of the following minimization transportation problem: **(6.5)**

	D1	D2	D3	D4	Supply
S1	11	13	17	14	250
S2	16	18	14	10	300
S3	21	24	13	10	400
Demand	200	225	275	250	

(b) A computer centre has 4 expert programmers. The centre wants 3 application programmes to be developed. The head of the computer centre, after studying carefully the programmes to be developed, estimates the computer time in minutes required by the experts for the application programmes as follows: **(6)**

		Application Programmes		
		A	B	C
Programmers	1	15	18	10
	2	14	17	8
	3	16	19	17
	4	20	14	17

How should the application programmes must be allocated, one per programmer, so as to minimize the total time?

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