647510 **BSc6MatC603x** Seat No :________

B.Sc. Semester - 6 (*CBCS*) Examination
March/April-2025 (NEW COURSE)
Optimization and Numerical Analysis-2 (Core (New))

Time: 2:30 Hours **Marks: 70**

Instructions:

1. All questions are compulsory.
2. Figures to the right indicate marks.

Que-1(A) Answer any two of the following questions. **(10)**

1) Explain the steps of the Big-M method.
2) Solve the following L.P.P. by two-phase method.

$$\text{Min.} Z = 5x_1 + 3x_2$$
Subject to $2x_1 + 4x_2 \leq 12,$
$2x_1 + 2x_2 = 10$
$5x_1 + 2x_2 \geq 10$
and $x_1, x_2 \geq 0.$

3) Solve the following L.P.P. by Big-M Method.

$$\text{Max.} Z = 3x_1 - x_2$$
Subject to $2x_1 + x_2 \geq 2$
$x_1 + 3x_2 \leq 3$
$x_2 \leq 4$
and $x_1, x_2 \geq 0.$

Que-1(B) Answer any one of the following questions. **(04)**

1) Explain the standard form of L.P.P. with its characteristics.
2) Solve the following L.P.P. by graphical method.

$$\text{Max.} Z = 11x + 9y$$
Subject to $3x + 2y \leq 8,$
$2x + 3y \leq 7$
and $x, y \geq 0.$

Que-2(A) Answer any two of the following questions. **(10)**

1) Explain least cost Method (L.C.M.) to find initial solution of a transportation problem.
2) Find optimal solution by MODI method.

	P	Q	R	S	Supply
A	6	3	5	4	22
B	5	9	2	7	15
C	5	7	8	6	8
Demand	7	12	17	9	

3) Solve the following assignment problem.

MEN

JOB	**1**	**2**	**3**	**4**	**5**
A	2	9	2	7	1
B	6	8	7	6	1
C	4	6	5	3	1
D	4	2	7	3	1
E	5	3	9	5	1

Que-2(B) **Answer any one of the following questions.** **(04)**

1) Find dual of the following primal LPP.

$$\text{Min. } Z_x = x_1 + x_2 + x_3$$

Subject to
$$7x_1 - 8x_2 + 4x_3 = 8$$
$$x_1 - 2x_2 \le 2$$
$$4x_2 - x_3 \ge 4$$

$x_1, x_2 \ge 0$ and x_3 is unrestricted in sign.

2) Find the initial solution of the following transportation problem by Vogel's approximation method.

	D_1	D_2	D_3	D_4	**Supply**
S_1	21	16	15	3	11
S_2	17	18	14	13	13
S_3	32	27	18	41	19
Demand	6	10	12	15	

Que-3(A) **Answer any two of the following questions.** **(10)**

1) State Gauss's forward and backward interpolation formula and hence deduce Stirling's formula.
2) Derive Laplace-Everett's formula.
3) Using Lagrange's interpolation formula, find the polynomial from the following data points.

x	0	2	3	6
f(x)	648	704	729	792

Que-3(B) **Answer any one of the following questions.** **(04)**

1) Derive relation between divided differences and forward differences.
2) If $f(1) = 2, f(1,3) = 13, f(1,3,6) = 10$ and $f(1,3,6,9) = 1$ then by Newton's divided difference formula, prove that $f(x) = x^3 + 1$.

Que-4(A) **Answer any two of the following questions.** **(10)**

1) Derive derivative formula using Newton's backward difference formula.
2) Obtain $f'(90)$ using Stirling's formula for derivative from following data:

x	60	75	90	105	120
f(x)	28.2	38.2	43.2	40.9	37.7

3) Derive Simpson's 3/8 rule.

Que-4(B) **Answer any one of the following questions.** **(04)**

1) Find the first derivative at $x = 1.5$, if

x	1.5	2.0	2.5	3.0	3.5	4.0
f(x)	3.375	7.000	13.625	24.000	38.875	59.000

2) Using Trapezoidal rule, evaluate: $\int_0^{10} \frac{1}{1+x^2} dx$, take $h = 0.1$

Que-5(A) **Answer any two of the following questions.** **(10)**

1) Solve $\frac{dy}{dx} = f(x,y), y(x_0) = y_0$ by Euler's improved method.
2) Obtain predictor and corrector formula to solve differential equation $\frac{dy}{dx} = f(x,y), y(x_0) = y_0$ by Milne's method.
3) Use Runge-Kutta method of order three, find y at x = 0.1, 0.2, 0.3, where $\frac{dy}{dx} + 2y = x;\ y(0) = 1$.

Que-5(B) **Answer any one of the following questions.** **(04)**

1) Solve the differential equation $\frac{dy}{dx} = f(x,y),\ y(x_0) = y_0$ by Taylor's method.
2) Using Picard's method to find $y(0.1), y(0.2)$, given that $y' = 1 + xy,\ y(0) = 1$.

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