647510 **BSc6MatC603x** **Seat No :________**

B.Sc. Semester - 6 (*CBCS*) Examination

April/May-2022 (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.

Q.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.

$$\text{Min. } Z = 3x_1 + 2x_2$$

Subject to $2x_1 + x_2 \geq 2,$

$3x_1 + 4x_2 \geq 12$

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 $x_1, x_2 \geq 0.$

(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 $x, y \geq 0.$

Q.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 basic feasible 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	45

(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

(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 $7x_1 - 8x_2 + 4x_3 = 8$

$x_1 - 2x_2 \leq 2$

$4x_2 - x_3 \geq 4$

$x_1, x_2 \geq 0$ 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	

Q.3 (A) Answer any two of the following questions. **[10]**

(1) State Gauss's forward and backward interpolation formula and hence deduce Sterling's formula.

(2) Using Newton's divided difference formula, evaluate $f(8)$ and $f(15)$, given that

x	4	5	7	10	11	13
$f(x)$	48	100	249	900	1210	2028

(3) Derive Lagrange's interpolation formula.

(B) Answer any one of the following questions. **[04]**

(1) If $y_{20} = 512, y_{30} = 439, y_{40} = 346$ and $y_{50} = 243$ then using Bessel's formula find the value of y_{25}.

(2) Prove that the divided differences are symmetrical in all their arguments.

Q.4 (A) Answer any two of the following questions. **[10]**

(1) The population of a certain town (as obtained from census data) is shown in the following table.

Year	1951	1961	1971	1981	1991
Population (in thousands)	19.96	36.65	58.81	77.21	94.61

Find the rate of the population in the year 1981.

(2) Derive Simpson's 3/8 rule.

(3) Derive general quadrature formula.

(B) Answer any one of the following questions. **[04]**

(1) Evaluate $\int_4^{5.2} \log(x)\, dx$ by using Simpson's 1/3 rule.

(2) State and prove Trapezoidal rule.

Q.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 Euler's modified method to get $y(0.25)$, given that $y' = 2xy,\ y(0) = 1$.

(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 Runge-Kutta's method to find $y(0.1), y(0.2)$ and y(0.3), given that $y' = xy + y^2, y(0) = 1$.

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