647510 **BSConaCC6030** **Seat No :________**

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

April/May-2022 (OLD COURSE)

OPTIMIZATION AND NUMERICAL ANALYSIS -2(CORE)

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

Instructions:

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

Q.1 (A) Answer any one of the following questions. **[07]**

(1) Explain the steps of simplex algorithm.

(2) Define: Slack and surplus variables and explain the Big-M method.

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

(1) Solve the following L.P.P. by two-phase method.

$$\text{Max. } Z = 3x_1 - x_2$$

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

$x_1 + 3x_2 \leq 2,$

$x_2 \leq 4,$

and $x_1, x_2 \geq 0.$

(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 $x, y \geq 0.$

(C)Answer any one of the following questions. **[03]**

(1) Write general mathematical form of a linear programing problem.

(2) Discuss how to assign coefficients to artificial variables in objective function in Big M method.

Q.2 (A) Answer any one of the following questions. **[07]**

(1) Explain Vogel's approximation Method (V.A.M.) to find initial solution of a transportation problem.

(2) Find optimal basic feasible solution by MODI method.

	W_1	W_2	W_3	Supply
F_1	16	20	12	200
F_2	14	8	18	160
F_3	26	24	16	90
Demand	180	120	150	450

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

(1) Find dual of the following primal LPP.

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

Subject to $2x_1 + 4x_2 \leq 160$

$x_1 - x_2 = 30$

$x_1 \geq 10$

and $x_1, x_2 \geq 0$

(2) Solve the following assignment problem.

MEN

JOB		1	2	3	4	5
	A	1	3	2	3	6
	B	2	4	3	1	5
	C	5	6	3	4	6
	D	3	1	4	2	2
	E	1	5	6	5	4

(C) Answer any one of the following questions. **[03]**

(1) Write full names of methods to find initial solution and optimum solution of a transportation problem.

(2) Write the mathematical formulation of transportation problem.

Q.3 (A) Answer any one of the following questions. **[07]**

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

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

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

(1) Given the values $f(14) = 68.7, f(17) = 64, f(31) = 44$ and $f(35) = 39.1$, find $f(27)$ using Lagrange's formula.

(2) Derive relation between divide differences and forward differences.

(C) Answer any one of the following questions. **[03]**

(1) If $f(x) = x^3$, show that $f(a^3, b^3, c^3) = a + b + c$.

(2) Write Sterling's interpolation formula and explain when it is useful?

Q.4 (A) Answer any one of the following questions. **[07]**

(1) In usual notation, prove that:

$$D^3 y_n = \left(\frac{d^3y}{dx^3}\right)_{x=x_n} = \frac{1}{h^3}\left[\nabla^3 y_n + \frac{3}{2}\nabla^4 y_n + \frac{7}{4}\nabla^5 y_n + \cdots\right]$$

(2) Derive general quadrature formula.

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

(1) Evaluate $\int_4^{5.2} \log(x)\, dx$ by using Trapezoidal rule.

(2) Derive Simpson's $\frac{1}{3}$ rule.

(C) Answer any one of the following questions. **[03]**

(1) Derive formula to find $\frac{dy}{dx}$ at $x = x_0$ from Newton's forward difference formula.

(2) Find the value of $\int_2^6 \frac{dx}{x}$ using Trapezoidal rule.

Q.5 (A) Answer any one of the following questions. **[07]**

(1) Solve $\frac{dy}{dx} = f(x, y), y(x_0) = y_0$ by Euler's modified 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.

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

(1) Solve: $y' = 1 + xy^2$ for $y(0.4)$ by Milne's method, given that $y(0) = 1, y(0.1) = 1.105, y(0.2) = 1.223, y(0.3) = 1.355$.

(2) Solve the differential equation $\frac{dy}{dx} = f(x, y), y(x_0) = y_0$ by Runge-Kutta's method.

(C)Answer any one of the following questions. **[03]**

(1) Let $\frac{dy}{dx} = x + y$, $y(0) = 1$. Find first approximation of y at $x = 0.1$ by Picard's method.

(2) Write working rule of Runge's method.

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