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RZ-003-001618 Seat No. _____

Third Year B. Sc. (Sem. VI) (CBCS) Examination

March - 2019

BSMT - 603 (A) : Optimization and Numerical Analysis - II

(Theory)

Faculty Code : 003

Subject Code : 001618

Time : $2\frac{1}{2}$ Hours] [Total Marks : **70**

Instructions : (1) All questions are compulsory.

(2) Figures to the right indicate full marks.

1 Answer the following objective type questions briefly in your answer book : **20**

(1) Write the standard form of Linear Programming Problem.

(2) Define: A Convex set.

(3) Define Concave Function.

(4) What is surplus variable with respect to the Linear Programming Problems?

(5) In simplex method if the objective function is of minimization then what are the changes we make in objective function of the given Linear Programming Problem?.

(6) Which is the best method to find initial solution of transportation problem? Why?

(7) What is the full form of the LCM method used to obtain an initial solution of transportation problem?

(8) Define: Convex Linear Combination

(9) Define: Degenerate B. F. S.

(10) Who invented the assignment algorithm?

(11) Define: interpolation.

(12) To interpolate near middle of the difference table which formulae are most suitable?

(13) When the arguments are unequally spaced, which formulae are used for interpolation?

(14) What is a special case of Bessel's formula?

(15) What is drawback of Lagrange's interpolation formula?

(16) What is Numerical integration?

(17) Which formula is also known as Newton-cot's formula?

(18) What is fifth divided difference of the polynomial of degree four?

(19) Write General Quadrature formula.

(20) Write Simpson's $\frac{1}{3}$ rule.

2 (A) Attempt any **three** : **6**

(1) Define :

(i) Feasible solution of Linear Programming Problem.

(ii) Non–degenerate B. F. S (w. r. t. Linear Programming Problem)

(2) Find the dual of the following primal linear programming problem:

Maximize : $Z = x_1 - x_2 + 3x_3$

Subject to the constraints :

$x_1 + x_2 + x_3 \leq 10$

$2x_1 - x_3 \leq 2$

$2x_1 - 2x_2 - 3x_3 \leq 6$

and $x_1, x_2, x_3 \geq 0$

(3) Write formulae for d_{ij} in the occupied cells and unoccupied cells in MODI method to solve the transportation problems.

(4) Explain the meaning of Optimization.

(5) Write General Mathematical form of Assignment Problem

(6) Write full form of B.F.S. and define the same with respect to Linear Programming Problems.

(B) Attempt any **three** : **9**

(1) Obtain the INITIAL solution of given transportation problem using LCM method.

		TO				
		D_1	D_2	D_3	D_4	*Supply*
From	S_1	19	30	50	10	7
	S_2	70	30	40	60	9
	S_3	40	8	70	20	18
	Demand	5	8	7	14	34

(2) Obtain the Initial solution of the above transportation problem using NWCM (North West Corner Method).

(3) Obtain the dual of the following :

Minimize : $Z = 5x_1 + x_2 - 6x_3$

Subject to the constraints

$-2x_1 + x_2 + 11x_3 \leq -2$

$-x_1 + 7x_2 + x_3 \geq 7$

$3x_1 - x_2 + 4x_3 \leq 5$

and $x_1, x_2, x_3 \geq 0$.

(4) Explain the rules of obtaining Dual LPP out of Primal LPP.

(5) Write the general mathematical form of the Linear Programming problems.

(6) Write the steps of the graphical method to solve the linear programming problems..

(C) Attempt any **two** : **10**

(1) Find the OPTIMUM solution of given ASSIGNMENT PROBLEM.

		Men			
		I	*II*	*III*	*IV*
Tasks	1	8	26	17	11
	2	13	28	4	26
	3	38	19	18	15
	4	19	26	24	10

(2) Obtain the OPTIMUM solution of given Transportation Problem using MODI method.

		Destination				
		D_1	D_2	D_3	D_4	*Supply*
Origin	S_1	5	3	6	4	30
	S_2	3	4	7	8	15
	S_3	9	6	5	8	15
	Demand	10	25	18	7	60

(3) Find ONLY BFS and construct ONLY FIRST TABLE to solve the following LPP using SIMPLEX METHOD (complete solution is not required)

Maximize : $Z = 3x_1 + 5x_2 + 4x_3$

Subject to the constraints

$2x_1 + 3x_2 \leq 8$

$2x_2 + 5x_3 \leq 10$

$3x_1 + 2x_2 + 4x_3 \leq 15$

and $x_1, x_2, x_3 \geq 0.$

(4) Explain steps of Two Phase Method to solve the Linear Programming Problems.

(5) Write the steps of Vogel's Approximation method to find initial solution of transportation problem.

3 (A) Attempt any **three** : **6**

(1) If $f(x) = x^3$ then find $f(1, 3, 5, 7)$.

(2) If $f(x) = x^{-1}$ then find $f(x_0, x_1)$.

(3) In usual notation prove that

$$D^3 = \frac{1}{h^3}\left[\Delta^3 - \frac{3}{2}\Delta^4 + \frac{7}{4}\Delta^5 + \ldots.\right]$$

(4) State Trapezoidal and Simpson's $\frac{3}{8}$ rule.

(5) Using Picard's method, find $y(0.1)$ given that $y' = 1 + xy, y(0) = 1, h = 0.1$.

(6) Find the value of y at $x = 0.2$ by Euler's method $\frac{dy}{dx} = 2x + y, y(0) = 1$.

(B) Attempt any **three** : **9**

(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) Apply Lagrange's formula to find $f(5)$ given that $f(1) = 2, f(2) = 4. f(3) = 8, f(4) = 16$ and $f(17) = 128$.

(3) Given that

x	1	1.1	1.2	1.3	1.4	1.5	1.6
y	7.989	8.403	8.781	9.129	9.451	9.750	10.031

Find $\frac{dy}{dx}$.

(4) Find the value of $\int_2^6 \frac{dx}{x}$ by 1. Trapezoidal rule 2. Simpson's $\frac{1}{3}$.

(5) Use Range's method to find $y(0.2)$ given that $y' = x + y, y(0) = 1$.

(6) Using Taylor series method solve $y' = xy + y^2, y(0) = 1 \; at \; x = 0.1$.

(C) Attempt any **two** : **10**

(1) State and prove Gauss forward interpolation formula.

(2) State and prove Laplace–Everett's formula.

(3) State and prove General Quadrature formula.

(4) State and prove Simpson's $\frac{3}{8}$ rule.

(5) Find the value of y at $x = 0.2, 0.4, 0.8, 1$ by Euler's method $\frac{dy}{dx} = 2x + y,\ y(0) = 1.$