HAF-003-001618 Seat No. _______

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

June / July – 2017

Mathematics : BSMT-603 (A)

(Optimization & Numerical Analysis - II)

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) Who invented the Simplex method to solve Linear Programming Problem?

(2) What is the meaning of the basic feasible solution of a linear programing problem?

(3) Name the method to find optimal solution of the transportation problem.

(4) While using Simplex Method to solve a Linear Programming Problem with the constraints of the type '$<$' _________ new variables are introduced.

(5) What is the full-form of **LCM** with respect to Transportation Problems ?

(6) If the Primal Linear Programming Problem is having an equation as a constraint then corresponding variable in the Dual Linear Programming Problem will be _________.

(7) The dual of the dual of any Linear Programming Problem is _________.

(8) What is meant by degenerate basic feasible solution of a Linear Programing Problem ?

(9) What is unbalanced transportation problem? Explain very briefly.

(10) If f(x) is a function defined over a convex set S, write the condition under which f(x) will be convex.

(11) Which formula is derived by taking $n = 3$ in general quadrature formula ?

(12) Write name of any one method to interpolate data with unequal intervals.

(13) What value of slop is taken to derive modified Euler's method ?

(14) Write Gauss forward interpolation formula.

(15) General quadrature formula is also known as __________.

(16) Write general formula for improved Euler's method.

(17) Which method is equivalent to first order Runge-Kutta's' method?

(18) Write name of any one predictor and corrector method.

(19) Which method is an average of Gauss forward and backward formulae ?

(20) Interpolating to halves is a special case of __________ formula.

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

(1) Define (i) Feasible Solution of Linear Programming Problem.
(ii) Surplus Variable. (W.R.T. Linear Programming Problem).

(2) Define (i) Optimum Solution. (W.R.T. Linear Programming Problem)
(ii) Basic Variable. (W.R.T. Linear Programming Problem)

(3) Define (i) Extreme Point of a Convex Set.
(ii) Convex Linear Combination.

(4) State general mathematical form of Transportation Problem.

(5) Define (i) Convex Set.
(ii) Convex Hull.

(6) State general form of Linear Programming Problem.

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

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

		Destination				Supply
		D_1	D_2	D_3	D_4	
Origin	O_1	19	14	23	11	11
	O_2	15	16	12	21	13
	O_3	30	25	16	39	19
Demand		6	10	12	15	43

(2) Explain the steps of **Unit Cost Penalty Method** to find initial solution of Transportation Problem.

(3) Explain the steps of the **TWO PHASE** method to solve the Linear Programming Problems.

(4) Solve the following Linear Programming Problem using **GRAPHICAL METHOD.**

Maximize $Z = 6x_1 + 11x_2$

Subject to the constraints

$$2x_1 + x_2 \leq 104$$

$$x_1 + 2x_2 \leq 76 \text{ and } x_1 \geq 0, x_2 \geq 0$$

(5) Explain in detail steps of MODI method to solve the Transportation Problem.

(6) Find **ONLY BFS** and construct **ONLY FIRST TABLE** to solve the following LPP using **BIG M METHOD** (complete solution is not required)

Minimize $Z = 2x_1 + x_2$

Subject to $3x_1 + x_2 = 3$

$4x_1 + 3x_2 \geq 6$

$x_1 + 2x_2 \leq 4$

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

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

(1) Explain steps of **Hungarian method** to solve the **Assignment Problem.**

(2) Find the **OPTIMUM** solution of given **ASSIGNMENT PROBLEM.**

		Men				
		I	**II**	**III**	**IV**	**V**
Job	**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

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

		Destination				Supply
		W_1	W_2	W_3	W_4	
Origin	F_1	5	3	6	4	30
	F_2	3	4	7	8	15
	F_3	9	6	5	8	15
Demand		10	25	18	7	60

(4) Obtain **DUAL LPP** of the following Primal LPP

Minimize $x_1 - 2x_2 \le 3$

Subject to $7x_1 - 8x_2 + 4x_3 = 8$

$x_1 - 2x_2 \le 3$

$2x_2 - x_3 \ge 4$

$x_1 \ge 0, x_2 \ge 0$

and x_3 is unrestricted in sign.

(5) Explain relationship between **PRIMAL** Linear Programming Problem and its **DUAL** Linear Programming Problem in detail with example.

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

(1) What is inverse interpolation? Write Lagrange's formula for inverse interpolation.

(2) Show that the sum of Lagrange's coefficients is one for $x_0 = -1, x_1 = 1, x_2 = 2$

(3) If $f(x) = x^3 - 2x$ then find f(2, 4, 9, 10).

(4) Prove that the value of any divided difference is independent of the order of the arguments.

(5) In usual notation prove that $D = \frac{1}{h}\left[\Delta - \frac{1}{2}\Delta^2 + \frac{1}{3}\Delta^3 - \frac{1}{4}\Delta^4 + \ldots\right]$

(6) Derive relation between,divided differences and forward differences.

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

(1) Explain Taylor series method to solve the differential equation .

(2) If a, b, c, d are the arguments of $f(x) = \frac{1}{x^2}$ then find f (a, b, c, d).

(3) For cubic polynomial if f(1)=2, f(1, 3)=13, f(1, 3, 6)=10, f(9)=730 then prove that f(x) = x^3+1.

(4) By means of Lagrange's formula, prove that, $y_1 = \frac{-2}{10}y_{-5} + \frac{1}{2}y_{-3} + y_3 - \frac{3}{10}y_5.$

(5) Explain Picard's method to solve the differential equation $\frac{dy}{dx} = f(x,y), y(x_0) = y_{0.}$

(6) In usual notation rove that $D^2 = \frac{1}{h^2}\left[\nabla^2 + \nabla^3 + \frac{11}{12}\nabla^4 + \ldots.\right]$

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

(1) Derive Gauss backward interpolation formula for central differences.

(2) Derive Bessel's formula for central differences.

(3) Derive Simpson's $1/8$ rule

(4) Obtain Lagrange's interpolation formula for unequal intervals.

(5) Explain Milne's Method to solve the differential equation $\frac{dy}{dx} = f(x, y), y(x_0) = y_0$.