* P B - 0 0 3 - 1 0 1 6 0 0 3 *

PB-003-1016003 Seat No. _____

B. Sc. (Mathematics) (Sem. VI) (CBCS) Examination

March / April - 2020

Optimization & Numerical Analysis - II : Paper - X

(New Course)

Faculty Code : 003
Subject Code : 1016003

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

Instructions : (1) All questions are compulsory.

(2) Numbers written to the right indicate full marks of question.

1 (a) Attempt the following objective type questions : **4**

(1) Define : Convex function (with respect to linear programming problem).

(2) Define : A feasible solution of LPP.

(3) Define : Surplus variable with respect to LPP.

(4) Define : Degenerate basic feasible solution.

(b) Attempt any one out of two : **2**

(1) State standard form of Linear Programming problem.

(2) State canonical form of Linear Programming problem.

(c) Attempt any one out of two : **3**

(1) Explain Graphical method to solve Linear programming problem.

(2) Explain in brief artificial variable technique.

(d) Attempt any one out of two : **5**

(1) Explain and write all the steps of simplex method.

(2) Explain the steps of Big-M method to solve the Linear Programming problem.

2 (a) Attempt the following objective type questions : **4**

(1) Write the full form of VAM.

(2) State the names of the three method of finding initial solution of transportation problems.

(3) Which method is used to solve assignment problems ?

(4) What is the name of method to find optimum solution of transportation problem ?

(b) Attempt any one out of two : **2**

(1) Write the general mathematical form of transportation problem.

(2) Solve the following assignment problem.

		MEN		
		A	*B*	*C*
Task	1	120	100	80
	2	80	90	110
	3	110	140	120

(c) Attempt any one out of two : **3**

(1) Obtain the Initial solution of given transportation problem using NWCM 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 dual of the following primal Linear Programming problem.

Maximize $z = x_1 - x_2 + 3x_3$

Subject to the constraints

$$x_1 + x_2 + x_3 \leq 10$$

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

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

and $x_1, x_2, x_3 \geq 0$

(d) Attempt any one out of two : **5**

(1) Write the steps of lowest cost entry method to find initial solution of transportation problem.

(2) Explain the rules for constructing the dual from of given primal LPP.

3 (a) Attempt the following objective type questions. **4**

(1) State Gauss's forward interpolation formula.

(2) What is the range of P for which the Gauss's backward interpolation formula is useful ?

(3) Which formula is mean of Gauss's forward and Gauss's backward interpolation formula ?

(4) What is the fourth divided difference of the polynomial of degree four ?

(b) Attempt any one out of two : **2**

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

(2) State the relation between divided differences and forward difference.

(c) Attempt any one out of two : **3**

(1) If $y_2 = 10,\ y_1 = 8,\ y_0 = 5,\ y_{-1} = 10$ then using Gauss's forward interpolation formula find the value of $y_{1/2}$.

(2) For $x_0 = -1, x_1 = 1$ and $x_2 = 2$ then prove that sum of coefficient of Lagrange's interpolation is 1.

(d) Attempt any one out of two : **5**

(1) State and prove Gauss backward interpolation formula.

(2) Derive Newton's divided difference formula.

4 (a) Attempt the following objective type questions : **4**

(1) What is the numerical differentiation ?

(2) Which formula known as Newton-Cot's formula ?

(3) For which value of n in general quadrature formula given Simpson's $\frac{3}{8}$ rule ?

(4) State Simpson's $\frac{1}{3}$ rule.

(b) Attempt any one out of two : **2**

(1) Find $\frac{dy}{dx}$ using Newton's forward interpolation formula.

(2) Find the value of $\int_2^6 \frac{dx}{x}$ by Simpson's $\frac{3}{8}$ rule.

(c) Attempt any one out of two : **3**

(1) Derive Trapezoidal rule.

(2) In usual notation prove that

$$D^2 = \frac{1}{h^2}\left[\nabla^2 + \nabla^3 + \frac{11}{12}\nabla^4 + \frac{5}{6}\nabla^5 + \ldots\ldots\ldots\right]$$

(d) Attempt any one out of two : **5**

(1) Derive General quadrature formula.

(2) Derive Simpson's $\frac{3}{8}$ rule.

5 (a) Attempt the following objective type questions : **4**

(1) State Taylor's formula to solve ordinary differential equation.

(2) In which interval to integrate y' to derive Milne's predictor formula to solve ordinary differential equation ?

(3) To find y, write Range's formula to solve ordinary differential equation.

(4) To find y, write Range Kutta's formula to solve ordinary differential equation.

(b) Attempt any one out of two : **2**

(1) Using Picard's formula to find $y(0.1)$ given that

$$y' = 1 + xy, \quad y(0) = 1, \quad h = 0.1$$

(2) Explain Euler's method to solve ordinary differential equation.

(c) Attempt any one out of two : **3**

(1) Find the value of y at $x = 0.1$ by Euler's method

$$\frac{dy}{dx} = 1 - y, \quad y(0) = 0, \quad h = 0.1$$

(2) Explain Euler's modified method to solve ordinary differential equation.

(d) Attempt any one out of two : **5**

(1) Explain Picard method to solve ordinary differential equation.

(2) Derive Milne's predictor and corrector formula to solve ordinary differential equation.
