DCK-003-2016003 Seat No. _____

B. Sc. (Sem. VI) (CBCS) (W.E.F.-2019) Examination

July – 2022

Mathematics : BSMT-10[A] *(Theory)*

(Optimization & Numerical Analysis-2)

Faculty Code : 003
Subject Code : 2016003

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

Instructions :

(1) All the questions are compulsory.

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

1 (a) Answer the following questions briefly : **4**

(1) Define : Feasible Points.

(2) Define : Initial feasible Solution.

(3) Define : Convex Sets.

(4) Define : Optimal Points.

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

(1) State the Matrix form of LPP.

(2) Define : Slack and Surplus Variables.

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

(1) Write the dual :

$$Min \quad Z = x_1 + 2x_2$$

$$2x_1 + 4x_2 \leq 160,$$

$$x_1 - x_2 = 30,$$

$$x_1 \geq 10$$

$$x_1, x_2 \geq 0$$

(2) Explain Graphical Method.

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

(1) Explain all the steps of Two Phase method.

(2) Explain all the steps of Simplex method.

2 (a) Answer the following questions briefly : **4**

(1) Write the full form of NWCM.

(2) A feasible solution of a transportation problem involves _____ number of allocations.

(3) Give the full form of LCM.

(4) Write the full form of VAM.

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

(1) Explain the mathematical form of Assignment problem.

(2) Explain LCM for solving Transportation Problem.

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

(1) Find the initial solution by LCM :

		To			*Supply*
		W_1	W_2	W_3	
From	P_1	2	7	4	5
	P_2	3	3	1	8
	P_3	5	4	7	7
	P_4	1	6	2	14
Demand		7	9	18	34

(2) State the Mathematical form of Transportation Problem.

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

(1) Explain Hungerian method to solve Assignment Problem.

(2) Solve the following Assignment problem :

		Men			
		1	2	3	4
Jobs	*I*	12	30	21	15
	II	18	33	9	31
	III	44	25	24	21
	IV	23	30	28	14

3 (a) Answer the following questions briefly : **4**

(1) Gauss Backward interpolation formula is obtained from which interpolation formula ?

(2) Laplace-Everett's formula is accurate for which range of p ?

(3) For which value of p the special case of Bessel's formula is obtained ?

(4) Which interpolation formula is considered to be universal interpolation formula ?

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

(1) Explain inverse interpolation.

(2) Write any two properties of divided differences.

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

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

(2) Find the polynomial satisfied by the following values using Newton's Formula :

X	-4	-1	0	2	5
$F(x)$	1245	33	5	9	1335

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

(1) Derive Gauss's Backward interpolation formula.

(2) Derive Stirling's formula.

4 (a) Answer the following questions briefly : **4**

(1) What is Numerical Integration ?

(2) Which formula is known as Newton Cote's formula ?

(3) Write the value of n to obtain Simpson's 1/3 Rule.

(4) What is the value of n to obtain Trapezodial Rule?

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

(1) Write the formula for Simpson's 3/8 Rule.

(2) In usual notation prove that :

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

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

(1) Find the value of $\int_2^6 \frac{dx}{x}$ using Simpson's 1/3 rule.

(2) Derive General Quadrature formula.

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

(1) Obtain the general formula to find first and second derivatives using Newton's forward interpolation formula.

(2) Derive Simpson's 1/3 Formula.

5 (a) Answer the following questions briefly : **4**

(1) To apply Milne's method at least how many values are priorly required ?

(2) The auxiliary equation k_1 obtain by Range-Kutta for the differential equation

$$\frac{dy}{dx} = x^2 + y^2, y(0) = 1 \text{ when } h = 0.1, \text{ is } \_\_\_\_\_$$

(3) Write Euler's formula to solve ordinary differential equation.

(4) Write Milne's Predictor formula to solve ordinary differential equation.

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

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

(2) Write the algorithm of RK method of second order.

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

(1) Explain Picard's Method to solve ordinary differential equation.

(2) Solve $\frac{dy}{dx} = 1 - y, y(0) = 0$ in the range $0 \le x \le 0.3$ using modified Euler's method.

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

(1) Explain Milne's Predictor and Corrector method to solve ordinary differential equation.

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