DCK-003-1016003 Seat No. ________

Third Year B. Sc. (Sem. VI) (CBCS) (W.E.F. 2016) Examination

July - 2022

Mathematics : BSMT-10[A]

(Optimization & Numerical Analysis - 2) (Theory)

Faculty Code : 003
Subject Code : 1016003

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 : Concave Sets.

(2) Define : Optimum Solution.

(3) Define : Convex Sets.

(4) Define : Feasible Region.

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

(1) State the mathematical form of LPP.

(2) Define : Slack and Surplus Variables.

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

(1) Write the dual : Min $Z_x = x_1 - 3x_2 + 2x_3$

Subject to,

$3x_1 - x_2 + 2x_3 \le 7,$

$-2x_1 + 4x_2 \le 12,$

$-4x_1 + 3x_2 + 8x_3 \le 10$

and $x_1, x_2, x_3 \ge 0$

(2) Explain Graphical Method.

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

(1) Explain all the steps of Simplex method.

(2) Explain Big M method to solve LPP.

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

(1) Write the full form of LCM.

(2) Name the method to find the optimum solution of Transportation method.

(3) How many allocations are to be made to get an initial solution of the transportation problem having m rows and n columns?

(4) Write the full form of VAM.

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

(1) Explain the mathematical form of Assignment problem.

(2) Explain NWC method.

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

(1) Find the initial solution by LCM.

		To				Supply
		D_1	D_2	D_3	D_4	
From	P_1	2	3	11	7	6
	P_2	1	0	6	1	1
	P_3	5	8	15	9	10
Demand		7	5	3	2	

(2) State the Mathematical form of Transportation problem.

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

(1) Explain Hungarian 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 Forward interpolation formula is obtained from which interpolation formula?

(2) Stirling's formula is useful 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) Attempt any **one** out of two : **2**

(1) Explain inverse interpolation.

(2) Write any two properties of divided differences.

(c) Attempt 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) Attempt 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 Trapezoidal rule?

(b) Attempt 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) Attempt 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) Attempt 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 Runge-Kutta for the differential equation $\frac{dy}{dx} = x^2 + y^2, y(0) = 1$ when $h = 0.1,$ is ________.

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

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

(b) Attempt 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) Attempt 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) Attempt 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 $\frac{dy}{dx} = f(x, y), y(x_0) = y_0$.
