QP Code: U25B053

Reg. No : .....

Name : .....

ST MARY'S COLLEGE (AUTONOMOUS), THRISSUR-20

II SEMESTER (FYUGP) DEGREE EXAMINATION, MARCH 2025

BCA

BCA2CJ103 : NUMERICAL ANALYSIS AND OPTIMIZATION TECHNIQUES

2024 Admission Onwards

(Credits: 4)

Time: 2 Hours **Maximum Marks: 70**

Section A

*Answer **all**. Each question carries **3** Marks* ***(Ceiling: 24 Marks)***

1. Construct the dual of: [BTL2]
   Maximize $z = 2000x_1 + 3000x_2$
   Subject to $6x_1 + 9x_2 \leq 100$
   $2x_1 + x_2 \leq 20$
   $x_1, x_2 \geq 0$.
2. Discuss any three numerical techniques for solving definite integrals? [BTL2]
3. State the general linear programming problem in standard form. [BTL3]
4. Define mathematical formulation of Transportation Problem. [BTL1]
5. Find second approximation of $x^3 - 5x + 3 = 0$, near x=2? [BTL4]
6. Discuss Simpson's 3/8 formula and explain each term. [BTL2]
7. Solve graphically the following LPP: [BTL3]
   Maximize $Z = 4x + y$
   subject to :- $x + y \leq 5, 3x + y \leq 9$ and $x, y \geq 0$.
8. Express the implementation technique of least cost cell method in transportation problem. [BTL1]
9. Find the difference $\sqrt{6.37} - \sqrt{6.36}$ to three significant figures. [BTL4]
10. Find the initial solution to the following transportation problem using Northwest Corner rule: [BTL4]

	$D1$	$D2$	$D3$	$D4$	$Supply$
$F1$	3	3	4	1	100
$F2$	4	2	4	2	125
$F3$	1	5	3	2	75
$Demand$	120	80	75	25	300

Turn Over

Section B

*Answer **all**. Each question carries **6** Marks* ***(Ceiling: 36 Marks)***

11. Find a root of the equation $f(x) = 3x - \sqrt{1 + \sin x}$ by using bisection method? [BTL3]

12. Using Simpson's (1/3)rd Rule, Find $\int_1^5 x^2 dx$ given h = 1. [BTL2]

13. Define artificial variables? Distinguish between slack and surplus variables. [BTL3]

14. Perform four iterations of the Newton-Raphson method to find the smallest positive root of the equation $f(x) = x^3 + x^2 - 1$. [BTL3]

15. Solve the following transportation problem : [BTL2]

	$D1$	$D2$	$D3$	$D4$	$Supply$
$Q1$	2	2	2	1	3
$Q2$	10	8	5	4	7
$Q3$	7	6	6	8	5
$Demand$	4	3	4	4	15

16. Compare Newton's forward and backward interpolation with difference table. [BTL4]

17. Suppose a furniture company makes chairs and tables only. Each chair gives a profit of Rs.20 whereas each table gives Rs. 30. Both products are processed by three machines M1, M2 and M3. Each chair requires 3 hrs, 5 hrs and 2 hrs on M1, M2 and M3 respectively, whereas the corresponding figures for each table are 3, 2 and 6. The machine M1 can work for 36 hrs per week, whereas M2 and M3 can work for 50 hrs and 60 hrs. Formulate the problem into a LPP in order to maximize the total profit ? [BTL1]

18. Solve the following assignment problem : [BTL3]

	A	B	C	D
P	17	10	6	8
Q	18	8	14	9
R	14	12	12	10
S	15	9	7	11

Section C

*Answer **any one**. Each question carries **10** Marks* ***(1x10=10 Marks)***

19. Explain Lagrange interpolation. Find f (11) using Lagrange's interpolation formula for the following table: [BTL2]

X :	5	7	10	12
Y :	10	12	15	18

20. Solve the following linear programming problem using simplex method: [BTL4]

Maximize $Z = 9x_1 + 2x_2 + 5x_3$

Subject to $2x_1 + 3x_2 - 5x_3 \leq 12$

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

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

$x_1, x_2, x_3 \geq 0$

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