QP CODE: D2BCA2503	(Pages: 2)	Reg. No : .....
		Name : .....

SECOND SEMESTER FYUGP EXAMINATION, APRIL 2026

(Regular/Improvement/Supplementary)

Discipline Specific Core (DSC) Courses - Major

BCA2CJ103 : NUMERICAL ANALYSIS AND OPTIMIZATION TECHNIQUES

(Credits: 4)

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

Section A. Answer the following questions. Each carries 3 marks (Ceiling: 24 marks)

1.	Define error. Give an example.	BL1	CO1
2.	Define Newton's Backward Interpolation formula.	BL1	CO2
3.	Find the value at $x = 2.5$ for the data points $(1, 3)\ and\ (2, 6)$ using Lagrange interpolation formula.	BL2	CO2
4.	What is the value of n , if we are finding value of $\int_0^6 \frac{x}{x^2+2}\ dx$ using Simpson's $3/8^{th}$ rule with $h = 1/2$?	BL2	CO2
5.	Mention any three advantages of Operations Research.	BL1	CO3
6.	Define feasible solution and Optimal solutions of LPP.	BL1	CO4
7.	Give a real-life example where Linear Programming can be applied.	BL3	CO4
8.	Cite any three areas where assignment technique is applied.	BL2	CO6
9.	Define feasible and Optimal solutions in transportation problem.	BL1	CO5
10.	State the condition for optimality in the MODI method.	BL1	CO5

Section B. Answer the following questions. Each carries 6 marks (Ceiling: 36 Marks)

11.	Apply four iterations of the Method of False Position to approximate the root of $f(x) = x^3 - 3x - 4$ in the interval $[2, 3]$.	BL3	CO1
12.	Find $\int_0^8 \frac{3x}{x^2+2}\ dx$ using Simpson's $1/3^{rd}$ rule with $n = 8$.	BL3	CO2
13.	Solve the following problem graphically , $\begin{aligned} \text{Max} : Z &= 40000x_1 + 55000x_2 \\ \text{S.t} : \quad 10x_1 &+ 15x_2 \leq 200 \\ 0 &\leq x_1 \leq 12 \\ 0 &\leq x_2 \leq 5 \end{aligned}$	BL2	CO4

(PTO)

14. Write the dual of the following LPP: BL2 CO4

$$\begin{aligned} \text{Minimize } & Z = 5x_1 + 2x_2 + 4x_3 \\ \text{Subject to: } & 3x_1 - 4x_2 + 2x_3 \geq 18 \\ & 3x_1 - 2x_2 + 6x_3 \leq 9 \\ & 2x_1 + x_2 - 3x_3 \leq 22 \\ & x_1, x_2, x_3 \geq 0 \end{aligned}$$

15. What is the condition for optimality in the Big M Method? BL2 CO4

16. Find an initial feasible solution to the transportation problem given below, by Vogel's approximation Method. BL2 CO5

Source/Dest.	D_1	D_2	D_3	Supply
S_1	2	7	4	5
S_2	3	3	1	8
S_3	5	4	7	7
S_4	1	6	2	14
Demand	7	9	18	

17. Find the initial feasible solution to the transportation problem given below, by North West Corner Rule. BL2 CO5

Source/Dest.	D_1	D_2	D_3	D_4	Supply
S_1	14	9	18	6	11
S_2	10	11	7	16	13
S_3	25	20	11	34	19
Demand	6	10	12	15	

18. Find the initial feasible solution to the transportation problem given below, by Lesat Cost Entry Method. BL2 CO5

Source/Dest.	A	B	C	D	Supply
1	1	5	3	3	34
2	3	3	1	2	15
3	0	2	2	3	12
4	2	7	2	4	19
Demand	21	25	17	17	

Section C. Answer any one question. Each carries 10 marks (1 x 10 = 10 Marks)

19. Find the root of $f(x) = x^3 - 2x^2 - 3$ using the Newton-Raphson method up to four decimal places near $x_0 = 2$. BL2 CO1

20. Find $\int_1^4 \frac{x^2+3}{2x+1}\, dx$ using Trapezoidal rule with $n = 10$. BL2 CO2

CO : Course Outcome **BL : Bloom's Taxonomy Levels** (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyse, 5 – Evaluate, 6 – Create)