

QP CODE: D2BCA2403

(Pages: 3)

Reg. No :

Name :

SECOND SEMESTER FYUGP EXAMINATION, APRIL 2025

MAJOR COURSE

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)

- Given the equation $f(x) = x^3 - 4$, apply the first iteration of the Method of False Position to find an approximate root in $[1, 2]$. BL2 CO1
- Give the Trapezoidal formula to find $\int_a^b f(x) dx$. BL1
- Define Artificial variable. Give an example. BL1 CO4
- Write a short note on Least Cost Entry Method. BL1 CO5
- Find the value at $x = 1.5$ for the data points $(1, 2)$ and $(2, 3)$ using Lagrange interpolation formula. BL2 CO2
- Define the terms.
a) Key Column
b) Key Row
c) Key element BL1 CO4
- What is a Balanced Transportation Problem? Give an example. BL1 CO5
- Find $\int_1^5 \frac{1}{2x+1} dx$ using Simpson's $1/3^{rd}$ rule with $n = 4$. BL2 CO2
- A farmer has 10 acres of land and wants to plant wheat and corn. Each acre of wheat requires ₹2000 for planting and provides a profit of ₹3000. Each acre of corn requires ₹3000 for planting and provides a profit of ₹5000. The total budget available is ₹24,000. Formulate the Linear Programming Problem to maximize profit. BL2 CO4
- Solve the following assignment problem. BL2 CO6

Men/Job	J_1	J_2	J_3
M_1	2	4	8
M_2	8	2	4
M_3	7	3	1

(PTO)

Section B

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

11. Given $f(x) = x^3 - 5x + 1$, find a root near $x_0 = 1$ correct to three decimal places using Newton-Raphson method .

BL2 CO1

12. Use Newton's Forward Interpolation to estimate $f(1.8)$ for the following data.

BL2 CO2

x	1	3	5	7	9
f(x)	22	25	13	25	37

13. Write the dual of the following LPP:

BL2 CO4

$$\text{Minimize } Z = 5x_1 + 2x_2 + 4x_3$$

$$\text{Subject to: } -4x_2 + 2x_3 \geq 18$$

$$3x_1 - 2x_2 + 6x_3 \leq 9$$

$$2x_1 - 3x_3 \leq 22$$

$$x_1, x_2, x_3 \geq 0$$

14. Find an initial feasible solution to the transportation problem given below, by Vogel's approximation 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	

15. Find $\int_{-1}^2 \frac{2x}{x+2} dx$ using Simpson's $3/8^{th}$ rule with $n = 6$.

BL2 CO2

16. Solve the following problem graphically:

BL2 CO4

$$\text{Max : } Z = 40x_1 + 80x_2$$

$$\text{S.t : } 2x_1 + 3x_2 \leq 48$$

$$0 \leq x_1 \leq 5$$

$$0 \leq x_2 \leq 10$$

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

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	

18. Write a short note on advantages and limitations of OR.

BL1 CO3

Section C

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

19. Apply the Bisection Method to find the approximate root of the equation $f(x) = x^3 - x - 1$ in the interval $[1, 2]$ perform ten iterations. Show all calculations.

BL2 CO1

20. Solve the following Transportation problem.

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	

CO : Course Outcome

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