D 120570   (**Pages : 3**)   Name...

Reg. No....................................

FOURTH SEMESTER (CBCSS–UG) DEGREE EXAMINATION, APRIL 2025

Information Technology

BIT4C07—NUMERICAL METHODS AND OPERATION RESEARCH

(2019–2023 Admissions)

Time : Two Hours   Maximum : 60 Marks

Section A – Short Answer Type Questions

Each correct answer carries a maximum of 2 marks.
Ceiling 20 marks.

1. Explain errors.

2. Find an approximation to $\sqrt{5}$ to ten decimal places.

3. State Lagrange's interpolation formula.

4. Use Taylor's series method $y^1 = x - y^2, y(0)$ find $y(0.1)$ correct to four decimal places.

5. Explain Trapezoidal Rule.

6. What are the properties of divided difference method ?

7. Write down the dual of the following LPP :

   Max : $Z = 4x_1 + 2x_3$

   Subject to $-x_1 - x_2 \le -3, -x_1 + x_2 \ge -2, x_1, x_2 \ge 0$.

8. What is degeneracy in Transportation problems ?

9. Explain the methods of solving differential equations.

10. Differentiate between slack and surplus variables.

11. Define feasible solution.

12. Solve the following LPP graphically :

   Max $Z = 60x_1 + 40x_2$

   St $2x_1 + x_2 \le 60, x_1 \le 25, x_2 \le 35, x_1, x_2 \ge 0$.

(Ceiling 20 marks)

Turn over

Section B

Ceiling 30 marks.
Each question carries 5 marks.

13. Find Solution of $x = 1925$ using Newton's Backward Difference formula :

X	: 1891	1901	1911	1921	1931
$f(x)$	: 46	66	81	93	101

14. Find Lagrange's interpolation polynomial fitting the points $f(1) = -3$, $f(3) = 0$, $f(4) = 30$, $f(6) = 132$. Hence find $f(5)$.

15. Solve the following assignment problem :

	A	B	C	D
1	7	5	8	4
2	5	6	7	4
3	8	7	9	8

16. Solve the following Transportation problem by Vogel's method :

	W_1	W_2	W_3	Supply
F_1	2	7	4	5
F_2	3	3	1	8
F_3	5	4	7	7
F_4	1	3	2	14
Demand	7	9	18	

17. Explain Taylor series method.

18. Explain MODI method.

19. An animal feed company must produce at least 200 kgs of a mixture consisting of Ingredients X1 and X2 daily. X1 costs Rs. 3 per kg and X2 cost Rs. 8 per kg .No more than 80 kg of X1 can be used and atleast 60 kgs of X2 must be used. Formulate a mathematical model to the problem.

(Ceiling 30 marks)

Section C

Answer any **one** *question.*
10 Marks.

20. Solve the following problem by simplex method :

    Maximise $Z = 6x_1 + 4x_2$

    Subject to $-2x_1 + x_2 \leq 2$
    $$x_1 - x_2 \leq 2$$
    $$3x_1 + 2x_2 \leq 9$$
    $$x_1, x_2 \geq 0$$

21. Find the solution to the following system of equations using the Gauss-Seidel method :

    $$12x_1 + 3x_2 - 5x_3 = 1$$
    $$x_1 + 5x_2 + 3x_3 = 28$$
    $$3x_1 + 7x_2 + 13x_3 = 76$$

    use $(x_1, x_2, x_3) = (1, 0, 1)$ as the initial guess and conduct two iterations.

    $(1 \times 10 = 10 \text{ marks})$