| QP Code: D 123075 | Total Pages: 2 | Name: |
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| | | Register No. |

**SECOND SEMESTER (CUFYUGP) DEGREE EXAMINATION, APRIL 2025**

**BCA**

**BCA2CJ103 / BCA2MN102 - Numerical Analysis and Optimization Techniques**

**2024 Admission onwards**

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

## Section A

**All Questions can be answered. Each Question carries 3 marks (Ceiling : 24 Marks)**

| | |
|---|---|
| 1 | State Simpson's (1/3)rd rule. |
| 2 | State the formula for bisection method |
| 3 | Write Newton Raphson formula. |
| 4 | Write the equation of Lagrange's interpolating polynomial through$(x_0, y_0)$ and $(x_1, y_1)$ |
| 5 | Using Trapezoidal rule find $\int_0^2 x^2\, dx$ |
| 6 | Write Simpson's Three- Eighths Rule formula. |
| 7 | What are the functions of O.R? |
| 8 | What are unbalanced transportation problems? |
| 9 | What are slack and surplus variables? |
| 10 | Write short notes on LCM. |

## Section B

**All Questions can be answered. Each Question carries 6 marks (Ceiling : 36 Marks)**

| | |
|---|---|
| 11 | Given $f(2) = 5, f(2.5) = 6$. Evaluate $f(2.2)$ using Lagrange's method |
| 12 | Use Newton-Raphson method to find a root of the equation $x^3 - 2x - 5 = 0$ |
| 13 | Using Newton's forward interpolation formula find the cubic polynomial for the data<br>X : 0 1 2 3<br>Y : 1 2 1 10 |
| 14 | Find the approximate value of $\int_0^1 \frac{1}{1+x}\, dx$ using Trapezoidal rule |
| 15 | AB Ltd manufactures two products A and B. To manufacture one unit of A, two units of material X and 4 units of material Y are required. To manufacture one unit of B, three units of X and two units of Y is required. As the raw material X is in short supply, not more than 16 units of X can be used. At least 16 units of material Y must be used in order to meet |

| | |
|---|---|
| | committed sales of A and B. Cost per unit of material X and Y are Rs. 2.5 and Rs. 25 respectively. You are required to formulate mathematical model |
| 16 | Solve the linear programming problem graphically<br>$$Max\ z = 4x_1 + 3x_2$$<br>Subject to the constraints<br>$$2x_1 + x_2 \leq 1000$$<br>$$x_1 + x_2 \leq 800$$<br>$$x_1 \leq 400, x_2 \leq 700$$<br>$$x_1 \geq 0, x_2 \geq 0$$ |
| 17 | Distinguish between Assignment problem and Transportation problem. |
| 18 | Find the initial solution of the following Transportation problem using Vogel's Approximation method |

| | $D_1$ | $D_2$ | $D_3$ | $D_4$ | Supply |
|---|---|---|---|---|---|
| $O_1$ | 190 | 300 | 500 | 100 | 70 |
| $O_2$ | 700 | 300 | 400 | 600 | 90 |
| $O_3$ | 400 | 100 | 600 | 200 | 180 |
| Demand | 50 | 80 | 70 | 140 | |

## Section C

**Answer any ONE .Each Question carries 10 marks (1x10=10 Marks)**

| | |
|---|---|
| 19 | Use the simplex method to solve LPP<br>$$Max\ z = 3x_1 + 2x_2$$<br>Subject to the constraints :<br>$$x_1 + x_2 \leq 4$$<br>$$x_1 - x_2 \leq 2$$<br>$$x_1\ , x_2 \geq 0$$ |
| 20 | Solve the following assignment problem for minimizing cost |

| | I | II | III | IV |
|---|---|---|---|---|
| A | 32 | 26 | 35 | 38 |
| B | 27 | 24 | 26 | 32 |
| C | 28 | 22 | 25 | 34 |
| D | 10 | 10 | 16 | 16 |