# Numerical Methods Application in Civil Engineering
## (1050)

P. Pages : 3

Time : Three Hours

Max. Marks : 100

Instructions to Candidates :
1. Do not write anything on question paper except Seat No.
2. Answersheet should be written with blue ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Figure to the right indicate full marks.
5. Use non-programmable calculator is allowed.
6. Assume suitable data.

## UNIT - I

1. State different types of errors in numerical computation and explain them. **10**

2. Find root of equation $x^3 - 5x + 1 = 0$ using bisection method correct up to 4 decimal place. **10**

3. Using Gauss Jordan method solve : **10**

   $x + 2y + z = 3$

   $2x + 3y + 3z = 10$

   $3x - y + 2z = 13.$

## UNIT - II

4. Define the variable used in L.P.P. and write down step involved in 2-phase simple method. **10**

5. Solve graphically the following L.P.P. **10**

   $\min (z) = 600x_1 + 400x_2$

   S.T $\quad 3000x_1 + 1000x_2 \geq 24000$

   $\quad 1000x_1 + 1000x_2 \geq 16000$

   $\quad 2000x_1 + 6000x_2 \geq 48000$

   $\quad x_1, x_2 \geq 0.$

6.      Solve the following L.P.P. by Big. M. Method.      10

$$\max z = 3x_1 + 2x_2 + 3x_3$$

S.T.    $2x_1 + x_2 + x_3 \leq 2$

$$3x_1 + 4x_2 + 2x_3 \geq 8$$

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

## UNIT - III

7.      Derive an expression for fitting parabolic curve, using principle of least square method.      10

8.      Using Lagrange's interpolation formula. Find value of 'y' when x = 9.5 from table.      10

| x | 7 | 8 | 9 | 10 |
|---|---|---|---|----|
| y | 3 | 1 | 1 | 9 |

9.      Find a parabola by method of least square to following data, also estimate y at x - 9.      10

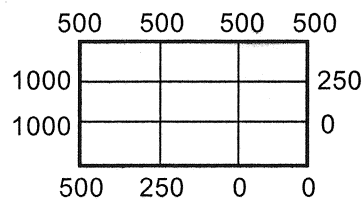| x | 1 | 2 | 3 | 4 | 5 |
|---|---|----|----|----|----|
| y | 7 | 12 | 26 | 60 | 97 |

## UNIT - IV

10.      What is concept of $4^{th}$ order R. K. Method. Draw flow chart of same.      10

11.      Solve : $\int_0^1 \dfrac{1}{1+x^2}$ using simpson's $\dfrac{1}{3}^{rd}$, $\dfrac{3}{8}^{th}$ ϕ Trapezoidal rule.      10

12.      Evaluate $\int_0^1 e^x \, dx$ by Gaussian Quadratic 2 point and three point formula.      10

## UNIT - V

**13.** What is boundary value problem ? How it is different from an initial value problem ? State general approach for solving problem by FEM.                    **10**

**14.** Solve the equation $\dfrac{dy}{dx} = 1 - y$, Given $y_0 = 0$ by modified Euler's method at x = 0.1, 0.2                    **10**

**15.** Estimate the function, U (x, y) satisfying $d^2u = 0$ and latest point given boundary values are as follows :                    **10**

```
       500   500   500   500
1000  ┌─────┬─────┬─────┐ 250
1000  ├─────┼─────┼─────┤ 0
      └─────┴─────┴─────┘
       500   250    0    0
```

\*\*\*\*\*\*\*\*\*\*\*\*\*