

80642

**B.Tech. (ECE, EIC) IVth Semester
COMPUTATIONAL TECHNIQUES
(HAS-206C)**

Time : 3 Hours]

[Max. Marks : 75

Instructions :

- (i) All questions are compulsory in Part-I.
- (ii) Attempt any four questions from Part-II.

PART-I

1. (a) If $u = \frac{4x^2y^3}{z^4}$ and error in x, y, z be 0.001, compute the relative maximum error in u when $x = y = z = 1$.
- (b) Write the formula of stirling method for interpolation.
- (c) Construct a forward difference table for the following :
- | | | | | | | |
|--------|---|---|-----|-----|-----|-----|
| x | : | 0 | 1 | 2 | 3 | 4 |
| $f(x)$ | : | 1 | 1.5 | 2.2 | 3.1 | 4.6 |
- (d) Solve $e^{-x} - x = 0$ by secant method.
- (e) Write the formula for Weddle's and Boole's rule.
- (f) Write the procedure to solve the simultaneous system of equation with the help of Relaxation method.
- (g) Write the formula for Euler's and Modified Euler's method.
- (h) Explain Crank-Nicolson method.

- (i) Find by Taylor's series method, the value of y at $x = 0.1$, $x = 0.2$ to five decimal places from

$$\frac{dy}{dx} = x^2 y - 1, \text{ given } y(0) = 1.$$

- (j) Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by using Trapezoidal Rule. (1.5 × 10 = 15)

PART-II

2. (a) Interpolate by means of Gauss' backward formula, the population of a town for the year 1974, from the given data. (7)

| | | | | | | |
|------------|------|------|------|------|------|------|
| Year | 1939 | 1949 | 1959 | 1969 | 1979 | 1989 |
| Population | 12 | 15 | 20 | 27 | 39 | 52 |

- (b) From the following table, find $f(x)$ as a polynomial in x and find $f(x)$ using Newton's divided difference formula. (8)

| | | | | | | |
|--------|----|-----|-----|-----|------|------|
| x | 4 | 5 | 7 | 10 | 11 | 13 |
| $f(x)$ | 48 | 100 | 294 | 900 | 1210 | 2028 |

3. (a) Find the root of equation $x = \frac{1}{2} + \sin x$ by using iteration method. (7)

- (b) Find the real root of equation $x^3 - 2x - 5 = 0$ by the method of false position correct to three decimal places. (8)

4. Solve the following system of equations by using Gauss-Jacobi and Gauss-Seidel methods (correct to three decimal places) : (15)

$$8x - 3y + 2z = 20$$

$$4x + 11y - z = 33$$

$$6x + 3y + 12z = 35.$$

5. (a) Use Romberg's integration method to find $\int_{-1}^1 \frac{dx}{1+x^2}$ correct to four decimal places. (7)

(b) Find the integral $\int_{-1}^1 \frac{e^x + e^{-x}}{2}$ using Simpson's 1/3rd and 3/8th rule by taking $h = 0.2$. (8)

6. Using RK method of order four, compute $y(0.2)$ and $y(0.4)$ from $10 \frac{dy}{dx} = x^2 + y^2$, $y(0) = 1$, taking $h = 0.1$. (15)

7. Solve the elliptic equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ (Laplace equation) for the following square mesh with boundary values as shown : (15)

