22515

**11920**

**3 Hours / 70 Marks** Seat No. | | | | | | | | |

***Instructions :*** (1) All Questions are *compulsory*.

(2) Answer each next main Question on a new page.

(3) Illustrate your answers with neat sketches wherever necessary.

(4) Figures to the right indicate full marks.

(5) Assume suitable data, if necessary.

(6) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

**Marks**

**1. Attempt any FIVE of the following :** **10**

(a) Give any two application of SCILAB software to solve algebraic equation.

(b) Define Matrix Inversion method.

(c) Give the conditions for Simpson's 1/3 rule and state the formula

(d) Write any two application of Newton – Raphson method.

(e) Differentiate between Euler's method and Modified Euler's method (any two points).

(f) Write any two application of SCILAB software to solve integration method.

(g) State the formula to solve second order differential equation using Runge Kutta method.

**2. Attempt any THREE of the following : 12**

(a) Explain the use of SCILAB software for solution of differential equation.

(b) Explain the concept of Gauss elimination method.

(c) Evaluate $\log_e 7$ by Simpson's 3/8 rule.

(d) Find the position root of $x^3 - 4x - 9 = 0$ by bisection method.

**3. Attempt any THREE of the following : 12**

(a) Evaluate $\int_0^{\pi} \frac{\sin^2 \theta}{5 + 4 \cos \theta} d\theta$ by Simpson's 3/8 rule taking $h = \pi/\sigma$

(b) Find the smallest positive root of $x^3 - 5x + 3 = 0$ by Newton – Raphson method. Correct to three decimal places.

(c) Use bisection method to find the positive root of eq$^n$ $x^3 + 3x - 1 = 0$

(d) Explain Runge Kutta method for solving differential equation.

**4. Attempt any THREE of the following : 12**

(a) Evaluate $\int_0^{\pi/2} \sqrt{\sin x \, dx}$ by using Simpson's rule taking six equal intervals.

(b) Use Euler's method to solve the equation $y' = -y$, $y(0) = 1$ find $y(0.01)$, $y(0.02)$, $y(0.04)$ taking $h = 0.01$.

(c) Calculate the approximate value of $\int_0^{\pi/2} \sin x \, dx$ by Simpon's 1/3 rule by using 6 ordinates.

(d) Find the real root of $xe^x - 2 = 0$ by false position method.

(e) Compute the value of $\int_{0.2}^{1.4} (\sin x - \log x + e^x) \, dx$ taking $h = 0.2$ by using Trapezoidal rule.

**5. Attempt any TWO of the following :** **12**

(a) Describe the features of SCILAB software in detail for numerical method.

(b) Solve the system of equation by Gauss Jordan method :

$x + 2y + z = 3$

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

$3x - y + 2z = 13$

(c) Determine 'h' so that the value of integration $\int_0^1 e^x dx$ obtained by trapezoidal rule is correct to 4 decimal places, hence find the numerical value of the integration.

**6. Attempt any TWO of the following :** **12**

(a) Use the Newton – Raphson method to find the real roots of the eq$^{n}$ $x = e^{-x}$

(b) Using Taylor's series method, solve the equation $y' = 3\ e^{x} + 2y$, $y(0) = 0$ find $y(0.1)$, $y(0.2)$

(c) Use Runge Kutta method to solve the equation :

$Y' = x^2 + y^2$, $y(0) = 1$. Find $y(0, 1)$ $y(0, 2)$

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