QP CODE : 536701

(3 Hours) [Total Marks : 80

Notes: (1) Question no 1 is compulsory

(2) Attempt any three out of remaining five questions.

(3) Figures to the right indicate marks.

(4) Assume suitable assumptions wherever required.

Q1 Answer the following:

(a) State and explain various program control loops in Scilab. [05]
(b) Draw tree diagram describing different types of methods used for solving [05]
   algebraic and transcendental equations.
(c) Explain derivation of formula for Regula-Falsi method. [05]
(d) Use secant method to estimate the root of the equation: (upto 2 iterations) [05]

$$x^2 - 4x - 10 = 0$$

Q2 (a) Solve the following system by Gaussian Elimination method. [10]

$$\begin{bmatrix} 9 & 3 & 4 \\ 4 & 3 & 4 \\ 1 & 1 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 7 \\ 8 \\ 3 \end{bmatrix}$$

(b) Solve the following system of linear equations using Gauss Siedel method. [10]

$$4x_1 + x_2 - x_3 = 3$$
$$2x_1 + 7x_2 + x_3 = 19$$
$$x_1 - 3x_2 + 12x_3 = 31$$

Q3 (a) Determine the roots of following simultaneous equations using Newton-Raphson [10]

method. (Perform at least 2 iterations)

$$x^2 + xy = 6$$
$$x^2 - y^2 = 3$$ $(x_0 = 1$ and $y_0 = 1)$

(b) Given $dy/dx = x^2 + 2y$, $y(0) = 1$ calculate $y(1.5)$ using step size 0.5 by Euler's method. [10]

Q4 A ball at 1200 K is allowed to cool down in air at an ambient temperature of 300K. [20]

Assuming heat loss is due to radiation, the differential equation of the temperature

of the ball is given by $dT/dt = -2.2067 \times 10^{-12} (T^4 - 81 \times 10^8)$, where T is in K and t is in sec.

Find the temperature of ball at t = 480 sec, using Runge Kutta method.

Assume step size of 160 seconds.

[TURN OVER

Q5 (a). Find the solution of following by Adam's PC method. [10]

$y' = y^2 \sin t$, given that $y(0) = 1$, $y(0.05) = 1.00125$, $y(0.1) = 1.00502$,

$y(0.15) = 1.01136$, calculate $y(0.2)$

(b) Use Runge - Kutta 4th order method for following differential equations: [10]

Given $dy/dx = (y+x)/(y-x)$, $y(0) = 1$ calculate $y(0.2)$ using step size 0.2.

Q6 (a) Find the root of the equation $x^4 - x - 10 = 0$, using Bisection method correct to 2 [10]

decimal places.

(b) Find the real root of $e^x \sin x = 1$ using linear interpolation method. [10]