Total No. of Questions—**8**] [Total No. of Printed Pages—**4**

Seat No.	

[5152]-549

S.E. (Electrical) (Second Semester) EXAMINATION, 2017

NUMERICAL METHODS AND COMPUTER PROGRAMMING

(2015 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. :— (*i*) Attempt Q. No. **1** or Q. No. **2**, Q. No. **3** or Q. No. **4** and Q. No. **5** or Q. No. **6**, Q. No. **7**. or Q. No. **8**.

(*ii*) Neat diagram must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*v*) Assume suitable data, if necessary.

1. (*a*) Find the real root of equation :

$$x^4 - 3x^3 + 3x^2 - 3x + 2 = 0$$

using Birge-Vieta method. Take $p_0 = 0.5$, show two iterations only. [6]

(*b*) What do you mean by entry control loop and exit control loop in 'C' language ? Write the syntax of any command from each type of loop. [6]

P.T.O.

Or

2. (*a*) What are the rules to declare a variable in 'C' language ? Distinguish which of the following are valid or invalid variable names : [6]

(*i*) 123 sppu

(*ii*) sppu_123

(*iii*) sppu @ 123

(*iv*) sppu123.

(*b*) Two numbers are defined with absolute error as $a \pm \varepsilon_{a1}$ and $b \pm \varepsilon_{a2}$. Prove that absolute error in $a \times b$ is $a\varepsilon_{a2} + b\varepsilon_{a1}$ and absolute error in $\frac{a}{b}$ is $\frac{b\varepsilon_{a1} - a\varepsilon_{a2}}{b^2}$. [6]

3. (*a*) Find the negative real root of equation $x^2 + 4 \sin(x) = 0$, correct to three decimal places with initial value of (–2) using NR method. [6]

(*b*) Obtain the Newton's backward differences polynomial passing through all points given below : [7]

x	*y*
0.1	1.4
0.2	1.56
0.3	1.76
0.4	2.00
0.5	2.28

Or

4. (*a*) A series RC circuit is connected across a DC supply of 100V. Voltage across a capacitor is recorded at different instant of time. Fit the following data point into second order degree curve using least square error method : [6]

t (in msec)	v_c (in Volts)
0	0
2	33
4	55
6	70
8	80
10	85

(*b*) Find the interpolating polynomial using Newton's divided difference formula for the following table : [7]

x	y
1	0
2	7
3	26
5	125

5. (*a*) Evaluate $\int_0^{0.9} \log_e (1+\sqrt{x})dx$ using Trapezoidal rule of integration with nine subintervals. [6]

(*b*) Using modified Euler's method solve the following differential equation to find the value of y at x = 0.1 and 0.2 Take step size of 0.1. Allowed error is 0.0001 $\frac{dy}{dx} = 1 + xy$ with $y(0)$ = 1. [7]

Or

6. (*a*) Calculate following by Simpson's $\frac{3}{8}th$ rule in 8 equal intervals : [6]

$$\int_0^{\frac{\pi}{2}} e^{\sin\theta}\, d\theta .$$

(*b*) Use 4th order RK method to estimate $y(0.2)$ when $y' = x^2 + y^2$ with $y(0) = 0$. Take step size of 0.2. [7]

7. (*a*) Explain Gauss Jacobi method to solve linear simultaneous equations. [6]

(*b*) Find the values of x_1, x_2 and x_3 using Gauss Jordan method : [6]

$$\begin{bmatrix} 1 & 1 & 1 \\ 4 & 3 & -1 \\ 3 & 5 & 3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 1 \\ 6 \\ 4 \end{bmatrix}$$

Or

8. (*a*) Explain Gauss elimination method to solve linear simultaneous equations. [6]

(*b*) Use Gauss Seidel method to solve the following system of equations at the end of 3rd iterations. Use initial values as x = 3, y = 2 and z = 1 : [6]

$$8x - 3y + 2z = 20$$
$$4x + 11y - z = 33$$
$$6x + 3y + 12z = 35.$$