Total No. of Questions : 8]

SEAT No. :

P9089

[Total No. of Pages : 3

[6179]-214

S.E. (Electrical Engineering)

NUMERICAL METHODS AND COMPUTER PROGRAMMING

(2019 Pattern) (Semester - IV) (203148)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
2) *Figures to the right side indicate full marks.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Assume suitable additional data, if ncessary.*
5) *Use of non - programmable calculator is allowed.*

Q1) a) Derive and explain Lagrange's Interpolation method. What are its application? **[6]**

b) Determine by Newtons divided difference interpolation method the percentage number of patients over 40 years, using following data. **[6]**

Age over (x years)	30	35	45	55
% number of (y) patients	148	96	68	34

c) Using central difference formula find the value of y at x=25 from the following table **[6]**

x	20	24	28	32
y	24	32	35	40

OR

Q2) a) Derive expression for Newton's Forward difference interpolation formula for equidistant points $(x_0, y_0), (x_1, y_1)..........(x_n, y_n)$ **[6]**

b) The day - wise total solar radiation (in MJ/m^2-day) is collected in the month of May which is required for experimentation. Use the appropriate interpolation Method to find solar radiation corresponding to 8th day. **[6]**

Day	1	3	5	7	9
total solar radiation (in MJ/m^2-day)	15.25	25.42	28.57	27.86	26.43

c) The following table shows the viscosity of an oil as a function of temperature. Use Lagrange's interpolation formula to find viscosity of oil at a temperature of 140° **[6]**

Temp (^{0})	110	130	160	190
Viscosity	10.8	8.1	5.5	4.8

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Q3) a) Derive formula for numerical differentiation of first order using Newton's forward interpolation technique. **[6]**

b) Evaluate the first and second derivative of $\sqrt{x}$ at x = 15 from the following data **[6]**

x	15	17	19	21	23
$\sqrt{x}$	3.873	4.123	4.354	4.583	4.796

c) Determine the integration using simpsons $\frac{3}{8}$ th rule. Take h=0.1 $\int_0^1 \frac{1}{1+x^2}dx$ **[5]**

OR

Q4) a) Derive Trapezoidal rule for numerical integration as a special case of Newton's Cote formula **[6]**

b) A river is 80 m wide. The depth d in meters at a distance x meters from one bank is given in the following table **[6]**

X(m)	0	10	20	30	40	50	60	70	80
D(m)	0	4	7	8	12	15	14	8	3

Find approximately the area of cross section by

1) Trapezoidal rule
2) Simpson's 1/3rd rule

c) Compute $\int_0^1\int_0^1 e^{x+y}\,dxdy$ by taking step sizes for both x and y are 0.5 using Trapezoidal Rule **[5]**

Q5) a) Explain Gauss - Seidel method for solution of linear simultaneous equation. (Numerical is not expected) **[6]**

b) Using Jacobi iterative method solve the following system of linear simultaneous equations. [6] Take x (0) = y(0) = z(0) = 0 perform 5 iterations.

$3x + y + z = 2$

$x + 4y + 2z = -5$

$x + 2y + 5z = 2$ **[6]**

c) State the advantages of Iterative methods over Direct method and Compare Gauss Elimination method and Gauss Jordan method. **[6]**

OR

Q6) a) Determine inverse of the following matrix using Jordan method. **[6]**

$$\begin{bmatrix} 1 & 1 & 1 \\ 4 & 3 & -1 \\ 3 & 5 & 3 \end{bmatrix}$$

b) Explain Gauss Elimination Method for solution of linear algebraic equations. (problem solving is not expected) **[6]**

c) Solve the following equations by using Gauss seidel method correct up 1 to 4 decimal places and show 3 iterations. **[6]**

$10x_1 + 2x_2 + x_3 = 9$

$x_1 + 10x_2 - x_3 = -22$

$2x_1 + 3x_2 + 10x_3 = 2$

using initial conditions $x_1 = x_2\, x_3 = 0$

Q7) a) Explain Taylor series method for the solution of ordinary differential equation. **[6]**

b) Find the value of $x = 0.1$ for the equation $\dfrac{dy}{dx} = 1 + xy$ and $y(0) = 1$. Take step size $h = 0.1$ by Taylor series method. **[6]**

c) Apply Euler's method to find y(1. 1). Given $\dfrac{dy}{dx} = xy$, $y(1) = 5$. Show 5 iterations. **[5]**

OR

Q8) a) Derive the formula for Euler's method to solve $\dfrac{dy}{dx} = f(x, y)$ also show graphically effect of reduction in step size in the Euler method. **[6]**

b) A resistance of 100 ohm and inductance of 0.5 Henry are connected in series with a battery of 15V. If i(0)=0, find the current flowing through the inductor at 0.001 sec using 4th order Runge Kutta method. Take interval of 0.001 sec. **[6]**

c) Find $y(0.1)$ for $y' = x^2 + y$, $x0 = 0$, $y0 = 0.94$, with step length 0.1 using Modified Euler method. **[5]**

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