

Total No. of Questions : 8]

SEAT No. :

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[6582]-14

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) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right indicate full marks.

Q1) a) Following table give the relation between  $x$  and  $y$ , determine  $y(3.5)$  using Newton's forward interpolation method [7]

$x$	3	4	5	6	7	8	9
$y$	4.8	8.4	14.5	23.6	36.2	52.8	73.9

b) For the following data find  $f(1.1)$  using Lagrange's interpolation [6]

$x$	1	1.2	1.3	1.4
$y$	1	1.095	1.140	1.183

c) Obtain the divided difference table for the following data point [4]

$x$	2	4	9	10
$y$	4	56	711	980

OR

Q2) a) For the given data, Find the value of  $y$  at  $x = 4.5$  using Newton's backward interpolation formula [7]

$x$	1	2	3	4	5
$y$	2.38	3.65	5.85	9.95	14.85

b) Derive Lagrange's interpolation formula for unequally spaced data with  $n$  number of values. [6]

c) Write the formula for Stirling's and Bessel's central difference interpolation. [4]

P.T.O.

**Q3) a)** Derive an expression for finding 1<sup>st</sup> order and 2<sup>nd</sup> order differentiation using Newton's forward difference interpolation formula for equal interval data points [7]

b) Evaluate  $\int_1^{1.8} \frac{e^x + e^{-x}}{2} dx$  using Simpson's 1/3 rule by taking  $h = 0.2$  [7]

c) Evaluate the value of the integral [4]

$\int_0^2 \frac{x}{\sqrt{2+x^2}}$  using Trapezoidal rule. The values for the integral are tabulated as below :

x	0	0.5	1	1.5	2
y	0	0.33333	0.57735	0.727606	0.81645

OR

**Q4) a)** The following table gives the velocity of the particle for 20 seconds at an interval of 5 seconds, find the acceleration at time  $t = 0$  [7]

time t(sec)	0	5	10	15	20
Velocity v(m/s)	0	3	14	69	228

b) Apply trapezoidal rule to evaluate [7]

$$\int_1^5 \int_1^5 \frac{dx dy}{\sqrt{x^2 + y^2}}$$

Take  $h = k = 2$

c) For the difference table given below, find  $\frac{dy}{dx}$  and  $\frac{d^2y}{dx^2}$  at  $x = 0.4$  [4]

x	y	$\nabla y$	$\nabla^2 y$	$\nabla^3 y$
0.1	2			
		4		
0.2	6		-1	
		3		1
0.3	9		0	
		3		
0.4	12			

Q5) a) Using Gauss - Elimination method solve. [6]

$$2x - y - z = 2$$

$$x + 2y + z = 2$$

$$4x - 7y - 3z = 2$$

b) Using Gauss - Seidal method solve [6]

$$4x + y + 2z = 16$$

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

$$x + 2y + 5z = 12$$

Using  $x = y = z = 0$ . Show 4 iterations

c) What is pivoting? Why is it used? What are the types of pivoting [5]

OR

Q6) a) Find the inverse of the given matrix using Gauss Jordan method [6]

$$A = \begin{bmatrix} 5 & -2 & 1 \\ 7 & 1 & -5 \\ 3 & 7 & 4 \end{bmatrix}$$

b) Using Gauss - Jacobi method solve [6]

$$4x + y + 2z = 16$$

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

$$x + 2y + 5z = 12$$

Using  $x = y = z = 0$ . Show 5 iterations.

c) Compare Gauss Seidal and Gauss Jordan methods for solution linear simultaneous equations. [5]

Q7) a) Solve using RK 4<sup>th</sup> order method. [7]

$$\frac{dy}{dx} = \sqrt{x+y}. \text{ Given that } y(0) = 1 \text{ get } y \text{ at } x = 0.2 \text{ take } h = 0.2$$

b) Explain Euler's method giving its graphical representation to solve

ordinary differential equation :  $\frac{dy}{dx} = f(x,y)$  [5]

c) Use Taylor series method to solve [6]

$$\frac{dy}{dx} = 1 + xy, y(0) = 1 \text{ to find value at } x = 0.1. \text{ Take step size as } h = 0.1.$$

Consider only 4 terms of the series.

OR

Q8) a) Solve using RK 4<sup>th</sup> order method [7]

$$\frac{d^2 y}{dx^2} = x \left( \frac{dy}{dx} \right)^2 - y^2 \text{ for } x = 0.2. \text{ Initial conditions are } x = 0, y = 0 \text{ and}$$

$$\frac{dy}{dx} = 0$$

- b) Use Modified Euler's method to solve  $\frac{dy}{dx} = x + y$ ,  $y(0) = 1$  to find value at  $x = 0.05$ . Take step size as  $h = 0.05$ . Answer correct upto 4 decimal places [6]
- c) Explain Taylor series method for the solution of ordinary differential equations. [5]

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