

Total No. of Questions : 8]

SEAT No. :

PA-1211

[Total No. of Pages : 3

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S.E. (Electrical)

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) Neat diagrams must be drawn wherever necessary.
- 3) Assume suitable data, if necessary.
- 4) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is permitted.
- 5) Assume suitable data, if necessary.

Q1) a) Prove

[6]

i)  $\Delta - \nabla = \Delta \nabla$

ii)  $(1 + \Delta)(1 - \nabla) = 1$

- b) Following table gives the distance in nautical miles of the visible horizon for the given heights in feet above earth. [6]

X height	200	250	300	350	400
Y distance	15.04	16.81	18.42	19.90	21.27

Find the distance when height is 218 feet.

- c) Derive the formula for Newton's forward interpolation formula for the equally spaced data points. [5]

OR

- Q2) a) Find  $f(10)$  of the cubic function passing through the points (4, -43) (7,83) (9,327) and (12,1053) using Newtons divided difference formula. [6]

- b) Derive Lagrange's Interpolation formula for unequally spaced data points. [6]

- c) Apply Bessel's central difference formula to obtain  $f(32)$  given that [5]

$f(25)=0.2707$   $f(30)=0.3027$   $f(35)=0.3386$   $f(40)=0.3794$

P.T.O.

Q3) a) Derive Trapezoidal rule for numerical integration as a special case of Newton's Cote formula. [6]

b) A river is 80m 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

- Trapezoidal rule
  - Simpson's 1/3<sup>rd</sup> rule.
- c) Derive formula for numerical differentiation of first order using Newton's forward interpolation technique. [5]

OR

Q4) a) Evaluate  $\int_0^1 \int_0^1 (x+y) dx dy$  using Simpsons 1/3<sup>rd</sup> rule with  $h=k=1/2$  [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) Derive Simpson's 1/3<sup>rd</sup> rule for numerical integration as a special case of Newton's Cote formula. [5]

Q5) a) Solve the system of equations by Gauss Jordan method [6]

$$x + y + z = 9$$

$$2x - 3y + 4z = 13$$

$$3x + 4y + 5z = 40$$

b) Use Gauss Seidel method to solve the following system of equations [6]

$$6x_1 + x_2 + x_3 = 105$$

$$4x_1 + 8x_2 + 3x_3 = 155$$

$$5x_1 + 4x_2 - 10x_3 = 65$$

c) Explain Gauss Jacobi method for the solution of linear simultaneous equations. [6]

OR

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Q6) a) Explain Gauss-Seidal method for solution of linear simultaneous equation. (Numerical is not expected) [6]

b) Apply Gauss Jordan method to find inverse of [6]

$$A = \begin{bmatrix} 3 & 0 & 2 \\ 2 & 0 & -2 \\ 0 & 1 & 1 \end{bmatrix}$$

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

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

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

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

Q7) a) Use 4<sup>th</sup> order RK method to estimate approximate value of  $y$  for  $x = 0.1$  with step size is 0.1, if  $dy/dx = x + y^2$  given that  $y = 1$  when  $x = 0$ . [6]

b) Apply Euler's method to find  $y(0.1)$ . Given  $\frac{dy}{dx} = xy$ ,  $y(1) = 5$ . Show 5 iterations. [6]

c) Explain Euler's method for the solution of ordinary differential equation. [6]

OR

Q8) a) Explain Taylor's series method for solution of ordinary differential equations. [6]

b) Use Runge Kutta second order method of find an approximate value of  $y$  correct to three places of decimal when  $x = 0.1$  given that  $y = 1.2$  when  $x = 1$  and  $\frac{dy}{dx} = 3x + y^2$ . [6]

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

x x x