

NUMERICAL METHODS

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Time : Three hours

Maximum : 75 marks

PART A — ( $10 \times 1 = 10$  marks)

Answer ALL questions.

Choose the correct answer

1. If  $f(x)$  is exactly divisible by  $x - \alpha$ , then  $\alpha$  is a root of \_\_\_\_\_.  
(a)  $f(x) = 0$  (b)  $f(x) = -1$   
(c)  $f(x) = 1$  (d) none of the above
2. Find the approximate interval of the root  $3 - x = E(x) - 1$   
(a) (0, 1) (b) (1, 2)  
(c) (2, 3) (d) (3, 4)
3. A matrix having  $n$  rows and  $n$  column is called \_\_\_\_\_.  
(a) Rectangular (b) Square  
(c) Diagonal (d) Unit



4. Find the Eigen value of the matrix

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

(a) 3.41

(b) 3.5

(c) 2

(d) 0

5. Find the missing values in the following table

$x:$  45 50 55 60 65

$y:$  3.0 - 2.0 - -2.4

(a) (0.2, 2)

(b) (2.9, 0.2)

(c) (2.925, 0.225)

(d) (0,0)

6. Using the method of final difference sum the following series  $1^2 + 2^2 + 3^2 + \dots + n^2$

(a)  $\frac{n(n+1)(2n+1)}{6}$

(b)  $\frac{2n+1}{6}$

(c)  $\frac{n(n+1)}{2}$

(d)  $n+1$

7. \_\_\_\_\_ rule provides more accurate integral result.

(a) Simpson

(b) Trapezoidal

(c) Wettle

(d) Boole.



8. If the value of  $x$  are not equispaced, we use \_\_\_\_\_ formula.

- (a) Newton's divided difference
- (b) Lagrange
- (c) Simpson
- (d) None of the above

9. The total error at any stage is comprised of \_\_\_\_\_

- (a) Round — off error
- (b) Syntax error
- (c) Relation error
- (d) Logical error

10. \_\_\_\_\_ method is the Runge - Kutta method of the 1<sup>st</sup> order

- (a) Tailor
- (b) Picart
- (c) Euler
- (d) Milne

PART B — ( $5 \times 7 = 35$  marks)

Answer ALL questions, choosing either (a) or (b).

11. (a) Find the real root of equation  $x^3 - 2x - 5 = 0$  by regulafalsi method. Correct to three decimal place.

Or

(b) Evaluate  $\sqrt{12}$  to 4 decimal place by Newton Raphson method.



12. (a) Apply Gauss elimination method to solve the equations.

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

$$x + y - 6z = -12;$$

$$3x - y - z = 4;$$

Or

- (b) Using Gauss Jordan method find the inverse

of matrix  $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}$

13. (a) Using Newton forward formula, find the value of  $f(1.6)$  if

$$x: \quad 1 \quad 1.4 \quad 1.8 \quad 2.2$$

$$f(x): \quad 3.49 \quad 4.82 \quad 5.96 \quad 6.5$$

Or

- (b) Estimate the value of  $f(22)$  and  $f(42)$  from the following available data :

$$x: \quad 20 \quad 25 \quad 30 \quad 35 \quad 40 \quad 45$$

$$f(x): \quad 354 \quad 332 \quad 291 \quad 260 \quad 231 \quad 204$$



14. (a) Find  $y'(0)$  and  $y''(0)$  from the following table

$x:$  0 1 2 3 4 5

$y:$  4 8 15 7 6 2

Or

- (b) The Velocity  $v(\text{km/min})$  of a moped which starts from rest, is given at fixed intervals of time  $t(\text{min})$  as follows:

$t:$  2 4 6 8 10 12 14 16 18 20

$v:$  10 18 25 29 32 20 11 5 2 0

15. (a) Find the approximate value of  $y$  at  $x = 0.1$

and  $x = 0.2$  from  $\frac{d(y)}{d(x)} = x^2 y - 1, y(0) = 1$ .

Or

- (b) Apply Runge-Kutta second order method to find the value of  $y$  given that  $\frac{dy}{dx} = x + y$  and  $y = 1$  and  $x = 0$ .



PART C — ( $3 \times 10 = 30$  marks)

Answer any THREE questions.

16. Find the real root of the equation  $x \log_{10} x = 1.2$  by regulafalsi method correct to four decimal method.

17. Solve jacobi's iteration method for the following equation

$$20x + y - 2z = 17$$

$$3x + 20y - z = -18;$$

$$2x - 3y + 20z = 25$$

18. Given the values

$$x: \quad 5 \quad 7 \quad 11 \quad 13 \quad 17$$

$$f(x): \quad 150 \quad 392 \quad 1452 \quad 2366 \quad 5202$$

Evaluate  $f(9)$ , using Lagrange's formula.

19. Use Romberg's method to compute  $\int_0^1 \frac{dx}{1+x^2}$  correct to 4 decimal places.

20. Using Runge-Kutta method of order 4, find  $y$  for  $x = 0.1, 0.2, 0.3$  given that  $\frac{dy}{dx} = xy + y^2$ ,  $y(0) = 1$ .