

31418(A)

Printed Pages : 4

T.D.C. (Part-III) Examination, 2020

(Honours)

MATHEMATICS

[ Paper : Eighth ]

[Paper Code : XH(III)-M(8) Num. Anal]

Time : Three Hours]

[Maximum Marks : 100

Note : Candidates are required to give their answers in their own words as far as practicable. The questions are of equal value. Answer any six questions.

1. State and prove fundamental theorem of difference table.

(a) Prove that  $\Delta x^{(n)} = n!x^{(n-1)}$

(b) Evaluate  $\left(\frac{\Delta^2}{E}\right)x^3$

3. (a) Establish Newton-Gregory backward difference interpolation formula.

(b) The following table is given :

x	0	1	2	3	4
f(x)	3	6	11	18	27

What is the form of the function f(x) ?

4. (a) Construct a divided difference table for the following :

x	1	2	4	7	12
f(x)	22	30	82	106	216

(b) If  $f(x) = \frac{1}{x^2}$ , find the divided differences f(a,b) and f(a,b,c).

5. (a) Establish the Trapezoidal rule for numerical interpolation.

(b) Calculate by Simpson's  $\frac{1}{3}$  rule an approximate

value of  $\int_{-3}^3 x^4 dx$  by taking seven equidistant ordinates.

6. (a) Discuss Picard's method of successive approximation.
- (b) Use Picard's method to approximate the value of  $y$  when  $x = 0.1$ , given that  $y = 1$  when  $x = 0$  and  $\frac{dy}{dx} = 3x + y^2$ .

7. Apply Runge-Kutta method to find approximate value of  $y$  for  $x = 0.2$  in step of  $0.1$  if  $\frac{dy}{dx} = x + y^2$  given that  $y = 1$  where  $x = 0$ , given  $f(x, y) = x + y^2$ .

8. (a) Explain Bisection method to find the root of the equation  $f(x) = 0$
- (b) Using Bisection method to find the root of the equation  $x^4 - x - 10 = 0$  which is near to  $x = 2$  correct to three places of decimals.

9. Discuss Graffe's root squaring method for solving polynomial equation.

Apply Gauss's elimination method to solve :

$$\begin{aligned} x + 4y - z &= -5 \\ x + y - 6z &= -12 \\ -3x - y - z &= 4 \end{aligned}$$

1. Apply Jordan's method to solve :

$$\begin{aligned} x + 2y + z &= 8 \\ 2x + 3y + 4z &= 20 \\ 4x + 3y + 2z &= 16 \end{aligned}$$

Write short notes on any two of the following :

- (a) Newton's Divided Differences
- (b) Weddle's Rule
- (c) Newton-Raphson Method
- (d) Forward and Backward Difference

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