340

B.A./B.Sc. (Part-III) Examination, 2019

MATHEMATICS

Paper - III

(Numerical Analysis and Programming in 'C')

Time Allowed : Three Hours]   *[Maximum Marks : 75*

Note : (i)   Attempt **all** sections as per instructions.

       (ii)   Calculator is allowed.

Section-A

Note : Attempt **all** questions. Give answer of each question in about 50 words.   2×10=20

1.   (i)   What do you mean by calculus of finite differences. Give example.

      (ii)   Find the function whose first difference is 5^x.

(2)

(iii) Define central difference for the values of a function f(x). Aslo prove that $\delta = \bar{E}^{-\frac{1}{2}}\Delta$.

(iv) Find the value of :

$$\frac{\Delta}{\Delta x}\left[3x^{(4)} - 2x^{(3)} - 3x^{(2)} + x - 5\right].$$

(v) Show that the function given by :

$$G(t) = (1-t)^{-2}$$

is the generating function of the sequence

1, 2, 3, 4, 5,...........

(vi) Solve the difference equation

$$2y_{k+2} - 5y_{k+1} + 2y_k = 0$$

(vii) Which of the following methods leads to tri-diagonal matrix :

(a) Jacobi's method

(b) Gass-Method

(3)

(c) Power series method

(d) Guen's method.

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

then write the only one non-tri-diagonal element of the matrix A

(viii) Define an algorithm. What is the criteria to be fulfilled by an algorithm.

(ix) Draw a flow chart to get the sum of two number.

(x) What is a pointer. How can we express a pointer.

Section-B

Note : Attempt **all** question. Give answer of each question in about 200 words. $5 \times 7 = 35$

2. Prove the following interpolation formula due to Newton :

$$f(x) = f(0) + x\Delta f(-1) + \frac{x(x+1)}{2!}\Delta^2 f(-2)$$
$$+ \frac{x(x+1)(x+2)}{3!}\Delta^3 f(-3) + \dots\dots\dots,$$

given values for x=0, -1, -2.........

OR

A third degree polynomial passes through the points (0, -1), (1, 1), (2, 1) and (3, 2). Find the polynomial.

3. Prove that :

(i) $\mu^2 = 1 + \frac{\delta^2}{4}$

(ii) $\sqrt{1 + \delta^2\mu^2} = 1 + \frac{\delta^2}{2}$.

4. By using Newton-Raphson Method find the root of $x^4 - x - 10 = 0$, which is nearer to x=2, correct to three places of decimal.

OR

What is a flow chart. Explain its various advantages. Also write its various symbols.

5. Derive Lagrange's formula for unequal intervals.

OR

By means of Lagrange's formula, prove that :

$$y_1 = y_3 - .3(y_5 - y_{-3}) + .2(y_{-3} - y_{-5}) \text{ approx.}$$

6. Assuming Stirling's formula, obtain the following approximation :

$$\frac{df(x)}{dx} = \frac{2}{3}[f(x+1) - f(x-1)] - \frac{1}{12}[f(x+2) - f(x-2)]$$

upto third differences.

OR

Write notes on :

(i) Arithmetic operators

(ii) Logical operators

Section-C

Note : Attempt any **two** questions. Give answer

P.T.O.

of each question in about 500 words.

$$2 \times 10 = 20$$

7. In an experiment, a quantity G was measured as follows :

$$G(20) = 95.90$$

$$G(21) = 96.85$$

$$G(22) = 97.77$$

$$G(23) = 98.68$$

$$G(24) = 99.56$$

$$G(25) = 100.41$$

$$G(26) = 101.24$$

compute $\int_{20}^{26} G(x)dx$ by Simson's rule.

8. Define Cote's number and prove that :

$$\sum_{k=0}^{n} C_k^n = 1.$$

9. Find the number of men getting wages be-

tween Rs.10 and Rs.15 from the following table :

Wages	Frequency
0-10	9
10-20	30
20-30	35
30-40	42

10. How one dimensional array differs from two dimensional array?

11. What is an integer constant? How many types are there of integer constants.