

Roll No. ....

**BCA-504(N)**

**B. C. A. (Fifth Semester)  
EXAMINATION, Dec., 2019**

**(New Course)**

**Paper Fourth**

**NUMERICAL METHODS**

*Time : Three Hours ]*

*[ Maximum Marks : 75*

**Note :** Attempt questions from all Sections as directed.

**Inst. :** The candidates are required to answer only in serial order. If there are many parts of a question, answer them in continuation.

**Section—A**

**(Short Answer Type Questions)**

**Note :** Attempt all questions from this Section. Each question carries 3 marks.

1. (A) Show that :

$$\mu = \sqrt{1 + \frac{\delta^2}{4}}$$

(B) Find a real root of :

$$f(x) = x^2 - x + 1 = 0$$

by Bisection method.

[ 2 ]

BCA-504(N)

(C) Write note on the following :

- (i) Stirling's formula
- (ii) Bessel's Interpolation Formula

(D) Obtain the first two approximation of :

$$y' = x + y^2$$

subject to  $y = 0$  when  $x = 0$  by Picard's method.(E) Construct a linear interpolating polynomial given the points  $(x_0, y_0)$  and  $(x_1, y_1)$ .

(F) What are the errors in Trapezoidal and Simpson's rules of numerical integration ?

(G) Find the error in the derivative of  $f(x) = \cos x$  by computing directly and using the approximation :

$$f'(x) = \frac{f(x+h) - f(x-h)}{2h}$$

at  $x = 0.8$ , choosing  $h = 0.01$ .(H) Express  $\Delta^2 f_0$  and  $\Delta^3 f_0$  in terms of the values of the function  $f$ .

(I) Prove that :

$$\Delta - \nabla = \Delta \nabla$$

Section—B

(Long Answer Type Questions)

Note : Attempt any two questions. Each question carries 12 marks.

2. (a) Find the cubic polynomial in  $x$ , which takes on the values : 6

-3, 3, 11, 27, 57 and 107

when  $x = 0, 1, 2, 3, 4$  and 5 respectively.

(b) Using Newton's forward difference formula, find the sum : 6

$$S_n = 1^3 + 2^3 + 3^3 + \dots + n^3$$

(C-69)

[ 3 ]

BCA-504(N)

3. Using Gauss forward formula, find the value of  $e^{1.17}$ , tabulated as below : 12

| $x$  | $e^x$  |
|------|--------|
| 1.00 | 2.7813 |
| 1.05 | 2.8577 |
| 1.10 | 3.0042 |
| 1.15 | 3.1582 |
| 1.20 | 3.3201 |
| 1.25 | 3.4903 |
| 1.30 | 3.6693 |

4. (a) Find the interpolating polynomial by Newton's divided difference formula for the following table and then calculate  $f(2.1)$  : 6

| $x$ | $f(x)$ |
|-----|--------|
| 0   | 1      |
| 1   | 1      |
| 2   | 2      |
| 4   | 5      |

(b) Given :

$$f(2) = 9$$

and

$$f(6) = 17$$

Find an approximate value for  $f(5)$  by the method of Lagrange's interpolation. 6

(C-69) P. T. O.

(b) Solve the system :

6

$$0.0004 x_1 + 1.402 x_2 = 1.406$$

$$0.4003 x_1 - 1.502 x_2 = 2.501$$

by Gauss elimination :

(i) without pivoting

(ii) with partial pivoting

8. Find a root of :

$$x \log_{10} x - 1.2 = 0$$

by Newton-Raphson's method correct to three decimal places.

12

9. Solve :

12

$$10x + y + z = 12$$

$$2x + 10y + z = 13$$

$$x + y + 5z = 7$$

Gauss-Seidel's method.