Roll No. .....

BCA–504(N)

B. C. A. (Fifth Semester)
EXAMINATION, Dec., 2017

(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 3 each

(Short Answer Type Questions)

Note : Attempt all questions from this Section.

1. (A) Prove that :

$$\left(\frac{\Delta^2}{E}\right)x^3 = 6x$$

(B) Define Descartes' rule of signs.

(C) A second degree polynomial passes through (0, 1), (1, 3), (3, 3). Find the polynomial.

(D) Find the missing figure in the following table :

x	y
0	1
1	2
2	–
3	8
4	16
5	–
6	64

(E) Find the third divided difference $f(3,4,5,6)$ where $f(x) = x^3 - x$.

(F) Prove that :

$$D = \frac{1}{n}\left[\nabla + \frac{\nabla^2}{2} + \frac{\nabla^3}{3} + \ldots\ldots\ldots\right]$$

(G) Calculate the value of $\int_{-3}^{3} x^4\,dx$ by Simpson's $\frac{1}{3}$ rule and trapezoidal rule. Also compare with exact value.

(H) Solve $x^3 - 9x + 1 = 0$ for the root lying between 2 and 4 by Regula-Falsi method.

(I) Explain Gauss's Elimination method for solving linear equation.

Section—B 12 each

(Long Answer Type Questions)

Note : Attempt any *two* questions.

2. Use Picard's method to approximate the value of y when $x = 0.1$ given that $y = 1$ when $x = 0$, and $\frac{dy}{dx} = 3x + y^2$.

3. Use Runge-Kutta method to find approximate value of y for $x = .2$ in steps of 0.1 of :

$$\frac{dy}{dx} = x + y^2$$

given that $y = 1$ where $x = 0$.

4. Interpolate by mean of Gauss' backward central interpolation formula of the population for the year 1966, given the following table :

Year	Population (10^3)
1931	12
1941	15
1951	20
1961	27
1971	39
1981	52

5. Find the first and second derivative of the function given below at the point $x = 1.2$.

x	y
1	0
2	1
3	5
4	6
5	8

Section—C 12 each

(Long Answer Type Questions)

Note : Attempt any *two* questions.

6. Find the value of x when $x^2 - 5x + 2 = 0$ by Newton-Raphson method.
7. Find a real root of the equation $x^3 - 2x - 5 = 0$ by the method of false position correct to three decimal places.
8. Apply Gauss-Seidel iteration method to solve the equations :

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

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

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

9. By means of Newton's divided difference formula find the value of $f(2), f(8)$ and $f(15)$ from the following table :

x	$f(x)$
4	48
5	100
7	294
10	900
11	1210
13	2028

2300