A
(21119)
B.C.A.-V Sem.

18024

B.C.A. Examination, November-2019
NUMERICAL METHODS
(BCA-504)

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

Note : Attempt questions from *all* sections as per instructions. Calculator is allowed.

Section–A
(Very Short Answer Questions)

Note : Attempt all *five* questions. Each question carries *3 marks*. Very short answer is required not exceeding 75 words. 5×3=15

1. Evaluate the following for h = 1 :

   $E = e^{hD}$

2. Construct a divided difference table for the following data :

x	3	5	9	15
y	2	14	38	74

3. Write the formula for Simpson's 3/8th rule.

4. Write the formula for Runge-Kutta method for 4th order.

5. Perform two iterations of Picard's method to find an approximate solution of the initial value problem :

$$\frac{dy}{dx} = x - y, \quad y(0) = 1$$

Section–B
(Short Answer Questions)

Note : Answer any *two* questions out of the following three questions. Each question carries 7½ marks. Short answer is required not exceeding 200 words. 2×7½=15

6. Using Euler's method find an approximate value of y for x = 1, considering h = 0.5, given that

$$\frac{dy}{dx} = x + y, \quad \text{and } y(0) = 1$$

7. Apply Newton's divided difference method to obtain an interpolatory polynomial for the following data:

x	3	5	7	9	11	13
f(x)	31	51	17	19	90	110

8. Find the first two derivatives of f(x) at x = 1 from the following table :

x	–2	–1	0	1	2	3	4
f(x)	104	17	0	–1	8	69	272

Section-C

(Detailed Answer Questions)

Note : Attempt any *three* questions out of the following five questions. Each question carries 15 marks. Answer is required in detail. 3×15=45

9. Derive Newton–Raphson's method to find a root of the equation f(x) = 0. Prove that this method has Quadratic Convergence.

10. Solve the following system of linear equations using Gauss-Seidel method :

$$10x + 3y + 7z = 41$$
$$3x + 20y + 17z = 101$$
$$x + 19y + 23z = 201$$

perform three iterations.

11. Define Lagrange's interpolation formula. Obtain Lagrange's interpolatory for the following data :

x	1	3	5	7	10
f(x)	13	31	25	37	101

12. State Runge-Kutta method of second order. Using Runge-Kutta method of fourth order find the values of y (0.2), y (0.4) and y (0.6) for the following initial value

$$\frac{dy}{dx} = x^3 - y^3$$

Write Condition that y (0) = 1.

13. Evaluate

$$\int_0 \frac{dx}{1+x^2}$$ by using

(a) Trapezoidal rule

(b) Simpson's 1/3 rule