2015

(3rd Semester)

BACHELOR OF COMPUTER APPLICATION

Paper : BCA–302

[Mathematics—III (Numerical Analysis)]

(New Course)

Full Marks : 75

Time : 3 hours

The figures in the margin indicate full marks for the questions

1. What is the relation between E and Δ? 1

2. Write the statement of bisection method. 2

3. Express $f(x) = 3x^3 - 4x^2 + 3x + 11$ into factorial polynomial and hence show that $\Delta^3 f(x) = 18$. 4

4. *(a)* Find a real root of the equation

$$\sin x = 10(x - 1)$$

using iteration method. 7

Or

(b) Using regula falsi method, find the real root of the equation

$$x^3 - 2x - 5 = 0$$ 7

5. *(a)* Solve the system of equations by Crout's method : 8

$$x_1 + x_2 - 2x_3 = 2 \cdot 5$$
$$4x_1 - 2x_2 + x_3 = 5 \cdot 5$$
$$3x_1 - x_2 + 3x_3 = 9$$

Or

(b) Use Gauss elimination method to solve : 8

$$2x + y + z = 10$$
$$3x + 2y + 3z = 18$$
$$x + 4y + 9z = 16$$

6. *(a)* Compute the values of e^x at $x = 0 \cdot 02$ and at $x = 0 \cdot 38$, using suitable interpolation formula on the table of data given below : 8

x :	0·0	0·1	0·2	0·3	0·4
e^x :	1·0000	1·1052	1·2214	1·3499	1·4918

Or

(b) Use Gauss forward formula to find a polynomial of degree four or less which takes the following values of the formula $f(x)$: 8

x	:	1	2	3	4	5
$f(x)$	:	1	−1	1	−1	1

7. *(a)* Find the value of y at $x = 5$ (using Lagrange's interpolation). Given 8

x	:	1	3	4	8	10
y	:	8	15	19	32	40

Or

(b) Given

$$\log_{10} 654 = 2 \cdot 8156$$
$$\log_{10} 658 = 2 \cdot 8182$$
$$\log_{10} 659 = 2 \cdot 8189$$
$$\log_{10} 661 = 2 \cdot 8202$$

Find the value of $\log_{10} 656$ by Newton's divided difference formula. 8

8. By dividing the interval into 6 equal parts, evaluate $\int_0^6 \frac{dx}{1+x^2}$, using—

(a) trapezoidal rule;
(b) Simpson's one-third rule;
(c) Simpson's three-eighth rule;
(d) Romberg's method. 10

(Turn Over)

9. Find $f'(1\cdot5)$ and $f''(1\cdot5)$ from the following table : 7

x :	1·5	2·0	2·5	3·0	3·5	4·0
$f(x)$:	3·375	7·000	13·625	24·000	38·875	59·000

10. *(a)* Use Picard's method of successive approximation to solve

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

with boundary conditions $y = 1$, when $x = 0$. 8

Or

(b) Use Runge-Kutta fourth-order method to solve

$$\frac{dy}{dx} = xy \text{ for } x = 1\cdot4$$

initially $x = 1$, $y = 2$ (take $h = 0\cdot2$). 8

11. Solve any *three* of the following differential equations : 4×3=12

(i) $x\dfrac{dy}{dx} + \dfrac{y^2}{x} = y$

(ii) $(1 - x^2)\dfrac{dy}{dx} - xy = 1$

(iii) $x^2dy + y(x + y)dx = 0$

(iv) $(x^2 - x^2y)dy + (xy^2 + y^2)dx = 0$

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