2016

(3rd Semester)

BACHELOR OF COMPUTER APPLICATION

Paper No. : BCA–302

[Mathematics—III (Numerical Analysis)]

(PART : A—OBJECTIVE)

(*Marks* : 25)

The figures in the margin indicate full marks for the questions

SECTION—I

(*Marks* : 15)

I. Tick (✓) the correct answer in the brackets provided : 1×10=10

1. The order of convergence in Newton-Raphson method is

   (a) 2 ( )

   (b) 3 ( )

   (c) 0 ( )

   (d) 4 ( )

2. In bisection method, the convergence is

   (a) linear ( )

   (b) quadratic ( )

   (c) very slow ( )

   (d) very fast ( )

3. Given polynomial $x^3 - 2x^2 + x - 1$, then $\Delta^4 f(x)$ equals to

   (a) $12x$ ( )

   (b) $6x^2 - 4x$ ( )

   (c) 12 ( )

   (d) 0 ( )

4. The value of $\int_2^4 \frac{dx}{x}$ is

   (a) $\log 2$ ( )

   (b) $2\log 2$ ( )

   (c) $\log 4$ ( )

   (d) 0 ( )

5. The 4th divided differences for x_0, x_1, x_2, x_3 is

(a) $\frac{[x_1, x_2, x_3]-[x_0, x_1, x_2]}{x_3 - x_0}$ ( )

(b) $\frac{[x_0, x_1, x_2, x_3]-[x_0, x_1, x_2]}{x_3 - x_0}$ ( )

(c) $\frac{[x_1, x_2, x_3]-[x_0, x_1, x_2]}{x_3 - x_1}$ ( )

(d) None of the above ( )

6. The value of $(1 + \Delta)(1 - \nabla)$ is

(a) 1 ( )

(b) 0 ( )

(c) 3 ( )

(d) 2 ( )

7. The number strips required in Simpson's 3/8th rule is a multiple of

(a) 1 ( )

(b) 2 ( )

(c) 3 ( )

(d) 6 ( )

8. The value of $\int_0^6 \frac{dx}{1+x^2}$, using Simpson's 1/3rd rule is

(a) 1·366 ( )

(b) 2·33 ( )

(c) 5·25 ( )

(d) 4·36 ( )

9. The degree of $\frac{d^2y}{dx^2} + 3\left(\frac{dy}{dx}\right)^3 + 2y = 0$ is

(a) 2 ( )

(b) 1 ( )

(c) 3 ( )

(d) 0 ( )

10. The order of $\frac{d^2y}{dx^2} + 3\left(\frac{dy}{dx}\right)^3 + 2y = 0$ is

(a) 2 ( )

(b) 3 ( )

(c) 1 ( )

(d) 0 ( )

II. Indicate *True (T)* or *False (F)* by a Tick (✓) mark : 1×5=5

1. The Newton-Raphson method fails when $f'(x) = 0$.

(T / F)

2. $\Delta\nabla = \delta^2$.

(T / F)

3. Gauss' forward interpolation formula employs odd differences just above the central line.

(T / F)

4. $\int_{x_0}^{x_0+nh} f(x)\,dx = \frac{h}{3}[(y_0 + y_n) + 4(y_1 + y_3 + \cdots + y_{n-1}) + 2(y_2 + y_4 + \cdots + y_{n+2})]$

is the general formula for trapezoidal rule.

(T / F)

5. The degree of $x\frac{dy}{dx} + \frac{2}{\frac{dy}{dx}} = y^2$ is 1.

(T / F)

SECTION—II

(*Marks* : 10)

III. Answer the following questions : 2×5=10

1. Write the general formula for Newton-Raphson method.

2. Express $y = 2x^3 + 3x^2 - 3x - 7$ in factorial notation.

3. Write the general formula for Lagrange's inverse interpolation.

4. Write the formula for Weddle's rule.

5. Verify that, $y = ce^{-x}$ is the solution of the differential equation $\frac{dy}{dx} + y = 0$.

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2016

(3rd Semester)

BACHELOR OF COMPUTER APPLICATION

Paper No. : BCA–302

[Mathematics—III (Numerical Analysis)]

Full Marks : 75

Time : 3 hours

(PART : B—DESCRIPTIVE)

(*Marks* : 50)

The figures in the margin indicate full marks for the questions

Answer **five** questions, selecting **one** from each Unit

UNIT—I

1. *(a)* Using Newton-Raphson method, find the positive root of $x^4 - x - 10 = 0$ correct to three decimal places. 6

(b) Solve $x^3 - 9x + 1 = 0$ for the root between $x = 2$ and $x = 4$ by the method of bisection. 4

2. *(a)* Solve the system of equations, using Gauss-Jordan method : 5

$x+y+z=3;\ x+2y+3z=4;\ x+4y+9z=6$

(b) Solve the system of equations, using triangularization method : 5

$10x+y+2z=13; \quad 3x+10y+z=14;$
$2x+3y+10z=15$

UNIT—II

3. *(a)* Prove that : 2+2=4

(i) $\Delta = E\nabla = \nabla E = \delta E^{\frac{1}{2}}$

(ii) $\mu = \frac{1}{2}(E^{\frac{1}{2}} + E^{-\frac{1}{2}})$

(b) Find the missing values in the following table : 6

x :	45	50	55	60	65
y :	3	—	2	—	-2·4

4. *(a)* Evaluate $\int_1^2 \frac{dx}{x(1+x^2)}$. 5

(b) Find the sum of the series $\frac{1}{1\times 2}+\frac{1}{2\times 3}+\cdots$ to n terms. 5

UNIT—III

5. *(a)* Using Newton's forward interpolation formula, find the value of y at $x = 7$, given that

x	:	4	6	8	10
y	:	1	3	8	16

5

(b) The pressure p of wind corresponding to velocity v is given by the following data : 5

v	:	10	20	30	40
p	:	1·1	2	4·4	7·9

Estimate p when $v = 35$, using Gauss backward formula.

6. *(a)* Using Lagrange's interpolation formula, find the value of $f(10)$, given that

x	:	1	7	15
y	:	168	192	336

5

(b) Find the value of y for $x = 7$, given that

x	:	2	5	9	11
$f(x)$	:	12	17	33	57

by means of Newton's divided difference formula. 5

UNIT—IV

7. *(a)* Determine $f'(4)$ for the following table : 5

x :	1	2	4	8	10
y :	0	1	5	21	27

(b) *Evaluate* $\int_0^1 x^3\,dx$, *using (i) Trapezoidal* rule and *(ii)* Weddle's rule. 5

8. *(a)* Using trapezoidal rule, evaluate

$$I = \int_1^2 \int_1^2 \frac{dx\,dy}{x+y}$$

taking four sub-intervals. 5

(b) Apply Simpson's rule to evaluate

$$I = \int_2^{2\cdot6} \int_4^{4\cdot4} \frac{dx\,dy}{xy}$$ 5

UNIT—V

9. *(a)* Using Runge-Kutta method of fourth order, solve $\frac{dy}{dx} = x + y$ with $y(0) = 1$. 5

(b) Solve $y' = x + y$, $y(0) = 1$ by Taylor's series method. Hence find the value of y at $x = 0 \cdot 1$. 5

10. Solve the following differential equations : 3+3+4=10

(i) $\frac{dy}{dx} + y = 1$

(ii) $\frac{dy}{dx} = \frac{x+y}{x-y}$

(iii) $x\frac{dy}{dx} + 2y = x\cos x$

★★★