2017

(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 Regula-Falsi method, find the real root of the equation $x^3 - 4x - 9 = 0$ correct to 3 decimal places. 5

(b) Use iteration method to find a root of the equation $x^3 + x^2 - 100 = 0$ to 4 decimal places . 5

2. *(a)* Solve the following by Gauss elimination method : 5

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

(b) Apply Gauss-Seidel method to solve the following equations : 5

$$20x + y - 2z = 17$$
$$3x + 20y - z = -18$$
$$2x - 3y + 20z = 25$$

UNIT—II

3. *(a)* Evaluate : 2+2=4

(i) $\Delta^2\left(\frac{1}{x^2 + 5x + 6}\right)$

(ii) $\Delta(e^{3x} \log 2x)$

(b) Express $u = x^4 - 12x^3 + 24x^2 - 30x + 9$ in factorial notation. Hence show that $\Delta^5 u = 0$. 3

(c) Obtain the function whose first difference is $2x^3 + 3x^2 - 5x + 4$. 3

4. *(a)* Sum the following series : 5

$$1^3 + 2^3 + 3^3 + \cdots + n^3$$

(b) Prove that $\delta = \Delta(1+\Delta)^{-\frac{1}{2}} = \nabla(1-\nabla)^{-\frac{1}{2}}$. 3

(c) Show that $\Delta^3 y_2 = \nabla^3 y_5$. 2

UNIT—III

5. *(a)* From the following table, find y when $x = 2{\cdot}4$ by Newton's interpolation formula : 5

x	1·7	1·8	1·9	2·0	2·1	2·2	2·3
y	5·474	6·050	6·686	7·389	8·166	9·025	9·914

(b) Using Gauss forward formula, find y when $x = 3 \cdot 75$ from the following table : 5

x	2·5	3·0	3·5	4·0	4·5	5·0
y	24·145	22·043	20·225	18·644	17·267	16·047

6. *(a)* The following table gives the values of x and y. Find the value of x when $y = 12$ using Lagrange's inverse interpolation method : 5

x	1·2	2·1	2·8	4·1	4·9	6·2
y	4·2	6·8	9·8	13·4	15·5	19·6

(b) Using Newton's divided difference formula, evaluate y when $x = 8$, from the following table : 5

x	4	5	7	10	11	13
y	48	100	294	900	1210	2028

UNIT—IV

7. *(a)* Find the derivative of $f(x)$ at $x = 0 \cdot 4$ from the following table : 5

x	0·1	0·2	0·3	0·4
y	1·10517	1·22140	1·34986	1·49182

(b) Evaluate

$$\int_0^6 \frac{dx}{1+x^2}$$

using *(i)* Simpson's $\frac{1}{3}$rd rule and *(ii)* Simpson's $\frac{3}{8}$th rule. 5

8. *(a)* Use Romberg's method to compute

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

correct to 4 decimal places. 5

(b) Apply trapezoidal rule to evaluate

$$\int_1^5 \int_1^5 \frac{dx\,dy}{\sqrt{x^2+y^2}}$$

taking two subintervals. 5

UNIT—V

9. *(a)* Using Picard's method, find an approximate value of y when $x = 0{\cdot}1$, if $\frac{dy}{dx} = x - y^2$ and $y = 1$ at $x = 0$. 5

(b) Using Euler's method, find an approximate value of y corresponding to $x = 1$, given that $\frac{dy}{dx} = x + y$ and $y = 1$, when $x = 0$. 5

10. Solve the following differential equations : 5+5=10

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

(ii) $x\frac{dy}{dx} + 2y = x\sin x$

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Subject Code : III/BCA/302

Booklet No. A

Date Stamp .....

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To be filled in by the Candidate

DEGREE 3rd Semester
(Arts / Science / Commerce / .....) Exam., **2017**

Subject .....
Paper .....

INSTRUCTIONS TO CANDIDATES

1. **The Booklet No. of this script should be quoted in the answer script meant for descriptive type questions and vice versa.**
2. **This paper should be ANSWERED FIRST and submitted within 1 (one) Hour of the commencement of the Examination.**
3. **While answering the questions of this booklet, any cutting, erasing, over-writing or furnishing more than one answer is prohibited. Any rough work, if required, should be done only on the main Answer Book. Instructions given in each question should be followed for answering that question only.**

To be filled in by the Candidate

DEGREE 3rd Semester
(Arts / Science / Commerce / .....) Exam., **2017**

Roll No. .....
Regn. No. .....

Subject .....
Paper .....

Descriptive Type
Booklet No. B .....

Signature of Scrutiniser(s)

Signature of Examiner(s)

Signature of Invigilator(s)

/264

2017

(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. A numerical integration when applied to a function of a single variable is known as

   (a) quadratuple ( )

   (b) quadrature ( )

   (c) quarterback ( )

   (d) None of the above ( )

2. The process of calculating the value of the derivative of a function at some assigned value of x from the given set of values (x_i, y_i) is called

   (a) calculus ( )

   (b) integration ( )

   (c) numerical analysis ( )

   (d) numerical differentiation ( )

3. The process of computing the value of the function outside the given range is called

   (a) interpolation ( )

   (b) extrapolation ( )

   (c) intervention ( )

   (d) None of the above ( )

4. In factorial notation, $[x^3]$ is

   (a) $x(x-1)$ ( )

   (b) $x(x-1)(x-2)$ ( )

   (c) $x(x-1)(x-2)(x-3)$ ( )

   (d) None of the above ( )

5. A polynomial $f(x)$ is called algebraic equation if $f(x)$ is

   (a) 1 ( )

   (b) 0 ( )

   (c) –1 ( )

   (d) None of the above ( )

6. In algebraic and transcendental equations, solutions are known as

   (a) roots ( )

   (b) solutions ( )

   (c) approximations ( )

   (d) None of the above ( )

7. The value of $E(y^2 + 4)$ is

   (a) $y^2 + 4$ ( )

   (b) $(y + h) + 4$ ( )

   (c) $((y + h)^2 + 4)$ ( )

   (d) None of the above ( )

8. $\delta y_{3/2} - \delta y_{1/2} =$

(a) $\Delta^3 y_{3/2}$ ( )

(b) μy_1 ( )

(c) $\delta^2 y_1$ ( )

(d) None of the above ( )

9. The interpolation method used for unequal intervals is

(a) Lagrange's interpolation formula ( )

(b) Newton's forward formula ( )

(c) Gauss backward formula ( )

(d) None of the above ( )

10. A differential equation may contain

(a) mathematical equation ( )

(b) derivatives ( )

(c) constants ( )

(d) All of the above ( )

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

1. In Gauss-Jordan method, we eliminate variable from all the equations in the first step itself.

(T / F)

2. The process of finding the value of y corresponding to the value of $x = x_i$ between x_0 and y_0 is called interpolation.

(T / F)

3. If a function contains trigonometric, logarithmic, exponential functions, it is called transcendental function.

(T / F)

4. The n th differences of a polynomial of the n th degree are constant and all higher order differences are zero.

(T / F)

5. $y_1 - y_0 = \Delta y_1 = \nabla y_0 = \delta y_{3/2}$.

(T / F)

SECTION—II

(*Marks* : 10)

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

1. Differentiate 'order' and 'degree' of a differential equation with example.

2. Write down the general formula for Newton's forward interpolation.

3. Express $y = 2x^3 - 3x^2 + 3x - 10$ in factorial notation.

4. Prove that $\nabla^2 y_8 = y_8 - 2y_7 + y_6$.

5. Prove that $y = -\frac{1}{3}x^{-2}$ is the solution of $\frac{dy}{dx} = 6y^2x$.

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