

I/BCA/102

2015

(1st Semester)

BACHELOR OF COMPUTER APPLICATION

Paper No. : BCA-102

[**Mathematics—I (Bridge Course)]**

(**New Course**)

Full Marks : 75

Time : 3 hours

(**PART : B—DESCRIPTIVE**)

(*Marks : 50*)

The figures in the margin indicate full marks for the questions

1. (a) Evaluate $(\sqrt{2} + 1)^6 + (\sqrt{2} - 1)^6$ using binomial theorem. 4
- (b) A bag contains ₹ 187 in the form of 1-rupee, 50-paise and 10-paise coins in the ratio of 3 : 4 : 5. Find the number of each type of coins. 4
- (c) What must be added to each of the numbers 9, 17, 21, 37 so that the new numbers are in proportion? 4

OR

2. (a) There are 20 boys in a class. Their average weight is 50 kg. When one boy leaves the class, the average reduces by 80 gram. Find the weight of the boy who left the class. 4

(b) Find (i) the greatest 4-digit number, and (ii) the smallest 4-digit number so that they are exactly divisible by 12, 15, 20 and 35. 4

(c) Find the 10th term of $\left(2x^2 + \frac{1}{x}\right)^{12}$. 4

3. (a) Write the first 5 terms of the sequence

$$a_n = (-1)^{n-1} \times 2^{n+1} \quad 3$$

(b) If the 9th term of an AP is 0, prove that its 29th term is double of the 19th term. 4

(c) Deduce the formula $S_n = \{2a + (n-1)d\}$ for the AP where n is the number of terms, a is the first element and d is the common difference. 5

OR

4. (a) Find the 10th and n th term of the geometric progression (GP)

$$12, 4, \frac{4}{3}, \frac{4}{9}, \dots \quad 3$$

(3)

- (b) Find three numbers in GP whose sum is 13 and the sum of whose squares is 91. 4
- (c) Explain the relation among arithmetic mean (AM), geometric mean (GM) and harmonic mean (HM) along with examples. 5
5. (a) Construct a matrix whose elements are given by
- $$a_{ij} = \frac{1}{2} |5i - 3j|$$
- 3
- (b) Express the matrix $A = \begin{bmatrix} 2 & 3 \\ 1 & 4 \end{bmatrix}$ as the sum of symmetric and skew-symmetric matrix. 4
- (c) By using elementary row operation, find the inverse of the matrix $\begin{bmatrix} 6 & 7 \\ 8 & 9 \end{bmatrix}$. 4

OR

6. (a) Find the minors of the determinant

$$A = \begin{vmatrix} 1 & -3 & 2 \\ 4 & -1 & 2 \\ 3 & 5 & 2 \end{vmatrix}$$

3

(b) Evaluate

$$\begin{vmatrix} 9 & 9 & 12 \\ 1 & -3 & -4 \\ 1 & 9 & 12 \end{vmatrix}$$

3

(c) Using the properties of determinant, prove that

$$\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ bc & ca & ab \end{vmatrix} = (a-b)(b-c)(c-a)$$

5

7. (a) Differentiate $\cot x$ from the 1st principle. 6

(b) Differentiate $\frac{1 + \sin x}{1 - \sin x}$. 6

(c) Differentiate $\sin 2x \cos 3x$. 3

OR

8. (a) Evaluate

$$\int \frac{(3x^4 - 5x^3 + 4x^2 - x + 2)}{x^3} dx$$

3

(b) Evaluate $\int \sec^{-1} x dx$. 3

(c) Evaluate $\int x \cos^3 x \sin x dx$. 5

(d) Evaluate $\int \frac{x^8}{(1-x^3)^{1/3}} dx$. 4

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(PART : A—OBJECTIVE)

(Marks : 25)

The figures in the margin indicate full marks for the questions

SECTION—I

(Marks : 15)

1. Put a Tick (✓) mark against the correct answer in the brackets provided : 1×10=10

(a) Prime number means

(i) a number that is an odd number ()

(ii) a number divisible by 3 ()

(iii) a number that has two factors ()

(iv) a number not divisible by even number ()

(b) Divisibility means

- (i) numerator and denominator must be same ()
- (ii) remainder must be 1 ()
- (iii) remainder must be 0 ()
- (iv) denominator must be bigger than numerator ()

(c) By adding the terms of a sequence, we get a/an

- (i) arithmetic progression ()
- (ii) geometric progression ()
- (iii) series ()
- (iv) arithmetic mean ()

(d) The general term of an AP is given by

- (i) $a + (1 - n)d$ ()
- (ii) $\frac{(n - 1)d}{a}$ ()
- (iii) $a + (n - 1)d$ ()
- (iv) None of the above ()

(e) For a 2×2 matrix given by $a_{ij} = (i + 2j)$, the element a_{22} is

(i) 1 ()

(ii) 3 ()

(iii) 5 ()

(iv) 6 ()

(f) The value of $\begin{vmatrix} -4 & 5 \\ -1 & -5 \end{vmatrix}$ is

(i) 15 ()

(ii) 25 ()

(iii) 35 ()

(iv) 45 ()

(g) The value of $\lim_{x \rightarrow 0} \sin x$ is

(i) 1 ()

(ii) 2 ()

(iii) 3 ()

(iv) 0 ()

(h) The value of $\frac{d}{dx}(x^n)$ is

(i) x^{n-1} ()

(ii) x^{n+1} ()

(iii) nx^{n+1} ()

(iv) nx^{n-1} ()

(i) In the AP 7, 13, 19, ..., 205, we have

(i) 32 terms ()

(ii) 33 terms ()

(iii) 34 terms ()

(iv) 35 terms ()

(j) The value of $\int \left(\frac{\log x}{x}\right)$ is

(i) $\frac{1}{x} \log x + c$ ()

(ii) $\sin x^2 + c$ ()

(iii) $x \log x + c$ ()

(iv) $\frac{1}{2}(\log x)^2 + c$ ()

2. Tick (✓) either *True* or *False* :

1×5=5

(a) The value of $\frac{d}{dx}(\sin^{-1} x)$ is $\frac{1}{\sqrt{1-x^2}}$.

True () / *False* ()

(b) All the diagonal elements are zeros in a diagonal matrix.

True () / *False* ()

(c) Integration is the inverse of differentiation.

True () / *False* ()

(d) The sum of the series 5, 9, 13, 17, ... up to 23 terms is 1127.

True () / *False* ()

(e) If $y = \frac{e^x}{x}$, then the value of $\frac{dy}{dx}$ is $\frac{e^x(x-1)}{x^2}$.

True () / *False* ()

(6)

SECTION—II

(Marks : 10)

Answer the following questions :

2×5=10

1. Differentiate between HCF and LCM.

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(7)

2. Which one is greater from the following?

$$\frac{8}{9} \quad \text{and} \quad \frac{2}{3}$$

(8)

3. Explain skew-symmetric matrix.

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(9)

4. If $5A = \begin{bmatrix} 5 & 10 & -15 \\ 2 & 3 & 4 \\ 1 & 0 & -5 \end{bmatrix}$, find A.

(10)

5. Differentiate $y = \sin x^3$.

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