

BCA/MAT : 101 (O)

2025

(1st Semester)



BACHELOR OF COMPUTER APPLICATIONS

Paper : MAT:101 (Old Course)

(Mathematics—I)

Full Marks : 70

Pass Marks : 45%

Time : 3 hours

(PART : B—DESCRIPTIVE)

(Marks : 50)

*The figures in the margin indicate full marks
for the questions*

1. (a) If $A = \begin{bmatrix} 1 & 3 & 2 \\ 1 & 0 & 2 \end{bmatrix}$, $B = \begin{bmatrix} 1 \\ 6 \\ 3 \end{bmatrix}$ and $C = \begin{bmatrix} 2 & 1 \end{bmatrix}$,

then prove that $A(BC) = (AB)C$.

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Or

Solve the following by Cramer's rule :

$$x - y - 2z = 3$$

$$2x + y + z = 5$$

$$4x - y - 2z = 11$$

(b) Prove that

$$\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix} = (a-b)(b-c)(c-a) \quad 4$$

2. (a) The sum of four numbers in AP is 32 and product of the extreme numbers is 55. Find the numbers. 3

(b) In a geometric progression, the common ratio is 2 and sum of the first 10 terms is 2046. Find the first term. 3

(c) If $\frac{a}{b+c}$, $\frac{b}{c+a}$ and $\frac{c}{a+b}$ are in harmonic progression, then prove that a , b and c are in harmonic progression. 4

3. (a) Find the derivative of e^{x^2} . 2

(b) If $y = \frac{(1+x^2)}{(1-x^2)}$, then find $\frac{dy}{dx}$. 3

(c) If $z = \log(x^2 + y^2)$, then show that

$$\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial y^2} = 0 \quad 5$$

(3)

4. (a) Evaluate : $\int (4x - 6)^7 dx$ 2

(b) Integrate by parts

$$\int x^3 \cdot e^{x^2} dx \quad 4$$

Or

Integrate by substitution

$$\int \frac{1}{(4x^2 + 7)} dx$$

(c) Evaluate : $\int \frac{(x^2 + 1)}{(x + 2)(2x + 3)(4x - 1)} dx$ 4

5. (a) What is the number of ways of choosing 4 cards from a pack of 52 playing cards? In how many of these—

(i) 4 cards are of same suit;

(ii) 4 cards belong to four different suits;

(iii) are face cards? 4

(b) A group of students consists of 5 boys and n girls. If the number of ways in which a team of three students can randomly be selected from this group such that there is at least one boy and at least one girl in each team is 1750, find the value of n . 6

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(1st Semester)

BACHELOR OF COMPUTER APPLICATIONS

Paper : MAT:101 (Old Course)

(**Mathematics—I**)

(**PART : A—OBJECTIVE**)

(Marks : 20)

The figures in the margin indicate full marks for the questions

1. Choose the most appropriate answer from the given options by putting a Tick (✓) mark in the brackets provided : 1×10=10

(a) The order of the matrix

$$A = \begin{bmatrix} 1 & 2 & 3 & 4 \end{bmatrix}$$

is

- (i) 4×4 ()
(ii) 4×1 ()
(iii) 1×4 ()
(iv) None of the above ()

(b) If $\begin{bmatrix} 2 & 1 \\ -1 & 0 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 7 \\ 2 \end{bmatrix}$, then the values of x and y are

(i) -2 and 11 ()

(ii) 2 and -11 ()

(iii) 2 and 11 ()

(iv) -2 and -11 ()

(c) ${}^nC_0$ is equal to

(i) 0 ()

(ii) 1 ()

(iii) n ()

(iv) $n!$ ()

(d) For two matrices A and B , matrix addition $A + B$ is possible if

(i) both matrices are of the same order ()

(ii) the column of matrix A is equal to the row of matrix B ()

(iii) the row of matrix A is equal to column of matrix B ()

(iv) None of the above ()

- (e) The number of 4-letter words, with or without meaning, which can be formed out of the letters of the word 'ROSE', where the repetition of the letters is allowed, is

(i) 256 ()

(ii) 24 ()

(iii) 255 ()

(iv) 25 ()

- (f) If ${}^nC_8 = {}^nC_2$, then the value of n is

(i) 8 ()

(ii) 9 ()

(iii) 10 ()

(iv) 2 ()

- (g) If a is the first term and d is the common difference, then the n th term of arithmetic progression is

(i) $a + nd$ ()

(ii) $\frac{1}{a + (nd)}$ ()

(iii) $a + (n - 1)d$ ()

(iv) $\frac{1}{a + (n - 1)d}$ ()

(h) If a , x and b are in GP, then the geometric mean between a and b is

(i) $\sqrt{a}$ ()

(ii) $\sqrt{b}$ ()

(iii) $\sqrt{ab}$ ()

(iv) ab ()

(i) In geometric progression, the ratio between any two consecutive terms is called

(i) common ratio ()

(ii) common difference ()

(iii) constant ratio ()

(iv) constant difference ()

(j) The value of $\frac{d}{dx}(x^2 + 3)$ is

(i) 2 ()

(ii) $2x^2$ ()

(iii) $2x$ ()

(iv) 3 ()

2. State whether the following statements are *True* or *False* by putting a Tick (✓) mark : 1×5=5

(a) The value of a determinant is zero when two or more rows or columns are identical.

True () *False* ()

(b) When the selection of objects is made disregarding the order of selection, it is called combination.

True () *False* ()

(c) The determinant value of a matrix

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

is zero.

True () *False* ()

(d) $\frac{d}{dx} \left[\frac{1}{\sqrt{x}} \right] = -\frac{1}{\sqrt{2}^3}$

True () *False* ()

(e) $\int_0^1 (x^2 + 3) = \frac{10}{3}$

True () *False* ()

3. Fill in the blanks using the following :

1×5=5

$$\frac{1}{x}, \frac{1}{x^2}, 1, e^x, e^{-x}, \sec^2 x, -\cos x, \cos x, -\frac{1}{x^2}$$

(a) $\frac{d}{dx}(\log x) = \dots\dots\dots$

(b) $\int e^x dx = \dots\dots\dots$

(c) $\frac{d}{dx}(\tan x) = \dots\dots\dots$

(d) $\int \sin x dx = \dots\dots\dots$

(e) $\frac{d}{dx}[(-x)^{-1}] = \dots\dots\dots$

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