



BCA/MAT-201

2024

(2nd Semester)

BACHELOR OF COMPUTER APPLICATIONS

Paper : MAT-201

(Mathematics—II)

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) Let $A = \{a, b, c, e, f\}$, $B = \{c, d, e, g\}$
and $C = \{b, c, f, g\}$ be the subsets of the
set

$$U = \{a, b, c, d, e, f, g, h\}$$

Find—

- (i) $A \cap (B \cup C)$
- (ii) $A - B$
- (iii) $B - C$
- (iv) $A - (B \cap C)$
- (v) $(B - C) \cup (C - B)$
- (vi) A'

6

Or

For any two sets A and B , prove that

$$(i) (A \cup B)' = A' \cap B'$$

$$(ii) (A \cap B)' = A' \cup B'$$

- (b) Determine the power set $\text{power}(A)$ of $A = \{a, b, c, d\}$.

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2. (a) Find the direction cosines of the sides of the triangle whose vertices are $(3, 5, -4)$, $(-1, 1, 2)$ and $(-5, -5, 2)$.

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- (b) Find the vector and Cartesian equations of the line passing through the points $A(x_1, y_1, z_1)$ and $B(x_2, y_2, z_2)$.

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Or

Find the equations of the line both in vector and Cartesian forms which pass through the points $(1, 2, 3)$ and are parallel to the vector $3\hat{i} + 2\hat{j} - 2\hat{k}$.

3. (a) Three cards are drawn successively without replacement from a pack of 52 well-shuffled cards. What is the probability that first two cards are kings and third card drawn is an ace?

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Or

20 cards are numbered from 1 to 20. One card is drawn at random. What is the probability that the number on the card drawn is—

- (i) a prime number;
- (ii) an odd number;
- (iii) a multiple of 5;
- (iv) not divisible by 3?

- (b) A die is thrown. If E is the event, 'the number appearing is a multiple of 3' and F be the event 'the number appearing is even', then find whether E and F are independent events. 6

4. (a) If $\cos x = -\frac{3}{5}$, x lies in the third quadrant, then find the values of the other five trigonometric functions. 5

Or

Prove that $\frac{\sin \theta - \cos \theta + 1}{\sin \theta + \cos \theta - 1} = \frac{1 + \sin \theta}{\cos \theta}$.

- (b) For all $x, y \in R$, prove that

$$\cos 2x = \cos^2 x - \sin^2 x = 2\cos^2 x - 1 \quad 3$$

- (c) Find the value of $\sin 75^\circ$. 2

5. (a) What is equivalence relation? Illustrate by giving example. 6
- (b) Find the domain and range of the real-valued function

$$f(x) = \frac{1}{\sqrt{x-4}}$$

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(Mathematics—II)

(PART : A—OBJECTIVE)

(Marks : 20)

The figures in the margin indicate full marks for the questions

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

(a) What is the possible number of outcomes when we toss a coin three times?

(i) 3 ()

(ii) 8 ()

(iii) 12 ()

(iv) None of the above ()

(b) Two coins are tossed simultaneously. The probability of getting at least one head is

(i) $\frac{1}{4}$ ()

(ii) $\frac{1}{2}$ ()

(iii) $\frac{3}{4}$ ()

(iv) None of the above ()

(c) A bag has 3 red balls and 5 black balls. If we take a ball from the bag, what is the probability of getting black balls only?

(i) $\frac{3}{5}$ ()

(ii) $\frac{5}{3}$ ()

(iii) $\frac{5}{8}$ ()

(iv) $\frac{3}{8}$ ()

(d) A die is thrown. Find the probability that a number less than 6 will appear.

(i) 1 ()

(ii) $\frac{4}{6}$ ()

(iii) $\frac{5}{6}$ ()

(iv) None of the above ()

(e) $1 + \tan^2 \theta =$

(i) $\cot^2 \theta$ ()

(ii) $\sec^2 \theta$ ()

(iii) $\sin^2 \theta$ ()

(iv) $\cos^2 \theta$ ()

(f) $\tan 0^\circ =$

(i) 1 ()

(ii) 0 ()

(iii) $\sqrt{3}$ ()

(iv) Not defined ()

(g) If θ lies in the 3rd quadrant, then

(i) only $\sin \theta$ and $\operatorname{cosec} \theta$ are positive ()

(ii) only $\cos \theta$ and $\sec \theta$ are positive ()

(iii) only $\tan \theta$ and $\cot \theta$ are positive ()

(iv) None of the above ()

(h) The general solution of the trigonometric equation $\sin \theta = 0$ is

(i) $n, n \in I$ ()

(ii) $2n, n \in I$ ()

(iii) $n\pi, n \in I$ ()

(iv) None of the above ()

(i) The direction cosines of the vector $-\hat{k}$ are

(i) $-1, 0, 0$ ()

(ii) $0, -1, 0$ ()

(iii) $0, 0, -1$ ()

(iv) $0, 0, 1$ ()

(j) The direction ratios of the line segment joining two points $A(2, 5, 7)$ and $B(3, 2, 9)$ are

(i) $2, -3, 3$ ()

(ii) $-1, 3, -2$ ()

(iii) $-2, -3, -4$ ()

(iv) $1, -3, 2$ ()

2. Match each of the sets on the left in the roster form (List—I) with the same set on the right given in the set builder form (List—II) by writing the codes of List—II in the brackets provided : 1×5=5

*List—I**List—II*

(a) {23, 29}

() (i) $\{x : x = 3^n, n \in N$
and $n \leq 5\}$

(b) {B, E, T, R}

() (ii) $\{x : x = n^3, n \in N,$
 $2 \leq n \leq 6\}$

(c) {3, 9, 27, 81, 243}

() (iii) $\{x : x \text{ is prime,}$
 $20 < x < 30\}$

(d) {8, 27, 64, 125, 216}

() (iv) $\{x : x \text{ is a letter of}$
word 'BETTER'

(e) {-1, 0, 1, 2}

() (v) $\{x : x \in Z,$
 $-2 < x < 3\}$

3. Fill in the blanks :

$$1 \times 5 = 5$$

(a) $\log_{10} 1000 = \dots\dots\dots$

(b) If l, m, n are the direction cosines of a line, then

$$l^2 + m^2 + n^2 = \dots\dots\dots$$

(c) $\frac{n!}{(n-1)!}$ where $n = 1000000 = \dots\dots\dots$

(d) $\log_{10} 0.01 = \dots\dots\dots$

(e) $\sin^2 \theta + \cos^2 \theta = \dots\dots\dots$
