

UNIVERSITY EXAMINATIONS

FIRST SEMESTER 2025/2026 ACADEMIC YEAR

**FIRST YEAR EXAMINATION FOR THE DEGREE OF
BACHELOR OF SCIENCE IN INFORMATION
COMMUNICATION AND TECHNOLOGY**

BICT 112: MATHEMATICS FOR IT

STREAM: R

TIME: 2 HRS

DAY: FRIDAY [14.30 – 16.30 P.M]

DATE: 06/02/2026

THIS QUESTION PAPER CONSISTS OF THREE (3) PAGES

PLEASE DO NOT OPEN UNTIL THE INVIGILATOR SAYS SO.

INSTRUCTIONS TO CANDIDATES**SECTION A: (Compulsory) TOTAL MARKS FOR THIS SECTION IS 30.****QUESTION ONE (30 MARKS)**

- a) Distinguish between game theory and set theory [4 Marks]
- b) Describe **THREE** significance of discrete mathematics in IT. [6 Marks]
- c) Given that a Set $A = \{ 1,2,3,4,5 \}$ and $B = \{ 4,5,6,7,8 \}$; find:
- i. $A \cup B$ [2 Marks]
 - ii. $A \cap B$ [2 Marks]
 - iii. $A - B$ [2 Marks]
 - iv. $B - A$ [2 Marks]
- d) Highlight **TWO** benefits of graphs as used in discrete mathematics [2 Marks]
- e) Let $U = \{ a,b,c,d,e,f,g \}$, $S = \{ a,b,c,d \}$, $T = \{ a,c,e,g \}$. List the elements of the following sets [4 Marks]

(i) S' (ii) $S \cup T$ (iii) $S \cap T$ (iv) $S' \cap T$

- f) Determine if $(p \wedge \sim q) \vee (\sim p \wedge q)$ is a tautology or not. [6 Marks]

SECTION B. TOTAL MARKS FOR THIS SECTION IS 40.

ANSWER ANY TWO QUESTIONS FROM THIS SECTION. EACH QUESTION IN THIS SECTION CARRIES 20 MARKS.

QUESTION TWO (20 MARKS)

In a group of 100 students, 72 students can speak English and 43 students can speak Hindi. Based on these data, answer the following questions:

- i.) Draw a venn diagram for the above information [10 Marks]
- ii.) Find the number of students who can speak English only. [3 Marks]
- iii.) Find the number of students who can speak Hindi only. [3 Marks]
- iv.) Find the number of students who can speak both English and Hindi. [3 Marks]

QUESTION THREE (20 MARKS)

- a) i) If 10 people each shake hands with each other, how many handshakes took place? [3 Marks]
- ii) What does this question have to do with graph theory? [3 Marks]
- b) For each of the following, try to give two *different* unlabeled graphs with the given properties, or explain why doing so is impossible.
- (i) Two different trees with the same number of vertices and the same number of edges. A tree is a connected graph with no cycles. [2 Marks]
- (ii) Two different graphs with 8 vertices all of degree 2. [2 Marks]
- (iii) Two different graphs with 5 vertices all of degree 4. [2 Marks]
- (iv) Two different graphs with 5 vertices all of degree 3. [2 Marks]
- c) Discuss the different Representation of Relations used in graphs Graph [6 Marks]

QUESTION FOUR (20 MARKS)

- a) Given that $A = \{3, 2, 1\}$, find $p(A)$ [3 Marks]
- b) Given that $A = \{2, 1\}$ and $B = \{5, 4, 3\}$. Prove that $A \times B \neq B \times A$ [6 Marks]
- c) Given the sets $A = \{a, b\}$, $B = \{3, 2\}$ and $C = \{4, 3\}$ Find
- (i) $A \times (B \cup C)$ [3 Marks]
- (ii) $(A \times B) \cup (A \times C)$ [8 Marks]

QUESTION FIVE (20 MARKS)

- a) Using a truth table determine if the propositions $p \rightarrow q$ and $(p \wedge q) \vee (\sim p \wedge \sim q)$ are logically equivalent. [5 Marks]
- b) Given that $f(x) = 2x^2$ and $g(x) = 3x - 2$, show that $f \circ g \neq g \circ f$. [6 Marks]
- c) Find all the integers such that $1 \leq 2x < 16$. [3 Marks]
- d) Prove that $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$. [6 Marks]