

END TERM EXAMINATION

SECOND SEMESTER [BCA] MAY-JUNE 2017

Paper Code: BCA-102

Subject: Mathematics-II

Time: 3 Hours

Maximum Marks: 75

Note: Attempt any five questions including Q.no.1 which is compulsory. Select one question from each Unit.

- Q1 (a) Let $A = \{1, 2, 3\}$ and $B = \{a, b, c\}$. Let $R = \{(1,b)(1,c)(3,b)\}$. Find the domain and range of the relation. Determine R^{-1} . (3)
- (b) Let D denote the set of all positive divisors of the positive integer n . Determine D_{16} , and represent it by Hasse Diagram. (2)
- (c) Define isomorphic and Hamilton Graphs with example. (3)
- (d) Let f, g , be functions from N to N (set of natural numbers) for $N \in N$ such that $f(n) = n + 1, g(n) = 2n$. Find $f \circ g$ and $g \circ f$. (3)
- (e) Define Tautology and contradictions. (2)
- (f) Show that the relation of parallel lines in the set of lines on a plane is an equivalence relation. (2)
- (g) Choose any two statements p and q as you like. Draw the truth table for $p \wedge q$, and $p \vee q$. (2)
- (h) Consider the graph $G (V, E)$ where v consists of Four vertices A, B, C, D and E of five edges where $e_1 = \{A,B\}, e_2 = \{B,C\}, e_3 = \{C,D\}, e_4 = \{A,C\}$ and $e_5 = \{B,D\}$, represent this undirected graph diagrammatically. Determine the degree of each vertex. (3)
- (i) Let f be a mapping from R to R such that $f(x) = 2x + 3$. Show that f is invertible and find its inverse. (3)
- (j) If $n(A) = 40, n(B) = 30, n(A \cap B) = 20$. Then find $n(A \cup B)$. (2)

Unit-I

- Q2 (a) Let $A = \{1, 2, 5, 6\}, B = \{2, 5, 7\}, C = \{1, 3, 5, 7, 9\}$. Verify $(A \times B) \cap \{A \times C\} = A \times \{B \times C\}$. (6)
- (b) Let $N = \{1, 2, 3, \dots, \dots\}$, denote the set of all positive integers and $A = \{x : x \in N, 3 < x < 12\}, B = \{x : x \in N, x \text{ is even, } x < 15\}$. Find $A \cap B, A \cup B, A^c$ and B^c . (6.5)
- Q3 (a) If R is an equivalence relation in a set A . Then prove that R^{-1} is also equivalence relation. (6)
- (b) For the sets A, B, C prove the following results.
(i) $A - (B \cap C) = (A - B) \cup (A - C)$, (ii) $A \times (B \cup C) = (A \times B) \cup (A \times C)$. (6.5)

Unit-II

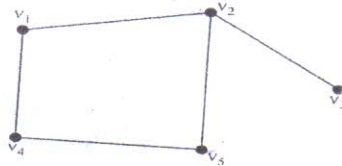
- Q4 (a) In a lattice (L, \leq) , prove that
(i) $a \wedge (b \vee c) \geq (a \wedge b) \vee (a \wedge c)$. (ii) $a \vee (b \wedge c) \leq (a \vee b) \wedge (a \vee c)$. (6)
- (b) Define Bounded lattice and prove that every lattice L is bounded. (6.5)
- Q5 (a) Define complemented lattice, also find the complement (if exists) of all elements of (D_{30}, I) . (6.5)
- (b) Let $A = \{1, 2, 3, 4, 6, 8, 9, 12, 18, 24\}$ be equipped with relation x divides y . Draw the Hasse diagram. (6)

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BCA-102

Unit-III

- Q6 (a) Let G be an undirected graph with m vertices, say $v_1, v_2, v_3, \dots, v_m$. Define the adjacent matrix A of G . Consider the undirected graph G with 5 vertices v_1, v_2, v_3, v_4, v_5 shown in the following diagram. Find the adjacent matrix of this graph. (6.5)



- (b) Draw the directed graph for the following incident matrix. Also find the degree of all vertex.

$$\begin{matrix}
 & e_1 & e_2 & e_3 & e_4 & e_5 & e_6 & e_7 & e_8 \\
 v_1 & \begin{bmatrix} -1 & 0 & 0 & 0 & -1 & -1 & 1 & 0 \end{bmatrix} \\
 v_2 & \begin{bmatrix} 1 & 1 & 0 & 0 & 0 & 0 & 0 & 1 \end{bmatrix} \\
 v_3 & \begin{bmatrix} 0 & -1 & -1 & 0 & 0 & 1 & 0 & 0 \end{bmatrix} \\
 v_4 & \begin{bmatrix} 0 & 0 & 1 & 1 & 0 & 0 & -1 & 0 \end{bmatrix} \\
 v_5 & \begin{bmatrix} 0 & 0 & 0 & -1 & 1 & 0 & 0 & -1 \end{bmatrix}
 \end{matrix}$$

(6)

- Q7 (a) Show that the two graphs shown in the figure are Isomorphic. (6.5)



- (b) Prove that the union of two graphs G_1 and G_2 will be a graph such that.
 $V(G_1 \cup G_2) = V(G_1) \cup V(G_2)$ and $E(G_1 \cup G_2) = E(G_1) \cup E(G_2)$. (6)

Unit-IV

- Q8 (a) By means of truth tables, justify that the conditional statement "If p then q " is logically equivalent to the statement "Not p or q ". (6.5)
 (b) Define a proposition. Let p and q be propositions and $p \rightarrow q$ denote compound proposition, "if p then q ". Draw the truth table for the compound proposition $p \rightarrow q$. Let p : you try, and q : you will succeed. Justify the truth table for $p \rightarrow q$. (6)

- Q9 (a) Verify De-morgan's laws for propositions. And also prove that.
 $P \wedge (q \vee r) = (p \wedge q) \vee (p \wedge r)$. (6.5)
 (b) Consider the following:
 P : Today is Tuesday, Q : It is raining, R : It is cold. (6)

Write in simple sentence the meaning of the following:

- (i) $\sim q \rightarrow (r \wedge q)$
 (ii) $(p \vee q) \leftrightarrow r$

BCA-102