*(Please write your Exam Roll No.)* **Exam Roll No.** 40421402016

# END TERM EXAMINATION

**SECOND SEMESTER [BCA] MAY-JUNE 2017**

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| ***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 $N \epsilon N$ such that $f(n) = n + 1$, $g(n) = 2n$. Find *fog* and *gof*. **(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 $N = \{1,2,3, \ldots \ldots\}$, 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)**
finite

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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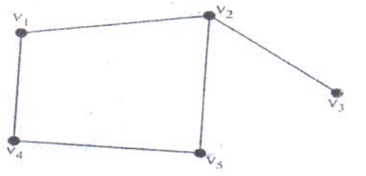
## Unit-III

Q6 (a) Let G be an undirected graph with m vertices, say $v_1, v_2, v_3, \ldots\ldots v_m$. 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)**

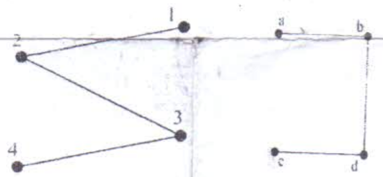



(b) Draw the directed graph for the following incident matrix. Also find the degree of all vertex.

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

**(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: **(6)**
P: Today is Tuesday, Q: It is raining, R: It is cold.

Write in simple sentence the meaning of the following:
(i) $\sim q \rightarrow (r \wedge q)$
(ii) $(p \vee q) \leftrightarrow r$

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