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

END TERM EXAMINATION

SECOND SEMESTER [BCA] APRIL - MAY 2019

Paper Code: BCA-102 **Subject: Mathematics-II**

Time: 3 Hours **Maximum Marks: 75**

Note: Attempt five questions in all including Q no. 1 which is compulsory. Select one question from each unit.

Q1 (a) Let Z be the set of integers and the relation defined over the set Z by aRb if $a^3 = b^3$ where a, b ∈Z. Is the relation R an equivalence relation? **(5)**

(b) Let D_{36} denote the set of all divisors of 36 ordered by divisibility. Draw the Hasse diagram of D_{36}. **(5)**

(c) By means of truth tables, justify that the conditional statement "If p then q" is logically equivalence to the statement "Not p or q". **(5)**

(d) Let $f: R \to R$ be defined by $f(x) = 2x - 3$ and $g: R \to R$ be defined by $g(x) = (x + 3)/2$ show that fog = gof **(5)**

(e) Define isomorphic and Hamiltonian graphs with examples. **(5)**

UNIT-I

Q2 (a) $A = \{2,3,7,8\}$, $B = \{1,3,5\}$, $C = \{3,5,7,11\}$ Find (i) B⊕C (ii) (A-B) (iii) A x B (iv) Partition of set B **(4)**

(b) If $A = \{1,2,3,4\}$, $B = \{1,2,3,4,5,6\}$, and $R = \{(a,b): a \in A, b \in B \text{ and } b = a + 1\}$, then: **(4)**

(i) Write R as a set of ordered pairs.

(ii) Find Domain and Range of R.

(iii) Find R^{-1}

(c) Show that the function $f: R \to R$ given by $f(x) = 3x - 4$ is a bijection. **(4.5)**

Q3 (a) Let the universal set $U = \{1,2,3,4,5,6,7\}$, $A = \{1,3,4,5\}$ and $B = \{1,2,4,6\}$. Verify De Morgan's Law. **(4)**

(b) Given $A = \{1,2,3,4,5,6\}$; Let R be a relation on A defined as $R = \{(x,y): x + y \text{ is a divisor of } 24\}$ **(4)**

(i) Find the domain and range of R.

(ii) Compute transitive closure of R.

(c) In a group of athletic teams in a school, 21 are in Basket ball team, 26 are in Hockey Team and 29 in Football Team. If 14 play Hockey and Basket ball; 12 play Football and Basket ball; 15 play Hockey and Football and 8 play all the three games, Find: **(4.5)**

(i) How many players are there in all?

(ii) How many plays Football only?

(iii) How many plays Basket ball only?

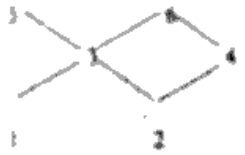
UNIT-II

Q4 (a) Prove that in a Distributive Lattice if an element has a Complement then this Complement is unique. **(6)**

(b) Consider the poset $A = \{a,b,c,d,e,f,g,h\}$ whose Hasse diagram is shown. Find (i) all upper bounds (ii) all lower bounds (iii) lub (iv) glb of the following subsets $B_1 = \{a,b\}$ and $B_2 = \{d,e\}$ **(6.5)**

P.T.O.

Q5 (a) Let $S = \{1,2,3,4,5,6\}$ be ordered on in the figure given below: **(6)**



Find (i) All minimal and maximal elements of S.
(ii) Greatest and least element.
(iii) All linearly ordered subset with three or more elements.

(b) Determine whether D_n is a finite Boolean algebra, where (i) $n = 12$ (ii) $n = 40$ (iii) $n = 75$ (iv) $n = 21$ (v) $n = 70$? **(6.5)**

UNIT-III

Q6 (a) Find the chromatic number of the graph given below using the Welch-Powell algorithms. **(6)**

(b) Draw a 3- regular graph with 6 vertices and complete graph with 5 vertices. **(6.5)**

Q7 (a) Define (i) Bipartite graph (ii) Cut Vertices (iii) Cut Edges **(6)**

(b) Consider the following adjacent matrix $A = \begin{bmatrix} 0 & 1 & 0 & 1 & 0 \\ 1 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 \\ 1 & 1 & 1 & 0 & 1 \\ 0 & 1 & 1 & 1 & 0 \end{bmatrix}$

Draw the undirected graph corresponding to the matrix A and also find the degree of all vertex **(6.5)**

UNIT-IV

Q8 (a) Consider the following - **(6)**
p; Today is Monday
q: it is hot
r: it is not raining
Write in simple sentence the meaning of the following.
(i) $\sim p \rightarrow (r \wedge q)$
(ii) $(p \vee r) \leftrightarrow q$

(b) Prove that $p \vee (q \wedge r) \equiv (p \vee \sim q) \vee \sim r$. **(6.5)**

Q9 (a) By means of truth table, prove that $\sim (p \leftrightarrow q) \equiv \sim p \leftrightarrow q \equiv p \leftrightarrow \sim q$. **(6)**

(b) Verify whether it is tautology or not $(p \wedge (q \rightarrow p)) \rightarrow p$. **(6.5)**

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