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END TERM EXAMINATION

SECOND SEMESTER [BCA] MAY-JUNE 2015

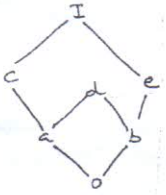
Paper Code: BCA-102 ***Subject: Mathematics (2011 onwards)***

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 R be the relation in the natural number N defined by the open sentence "(x-y) is divisible by 5", prove that R is an equivalence relation. **(4)**

(b) Consider the bounded lattice L



Find the complements of a & c, if they exist. **(4)**

(c) If $f(x) = x^3$, then find f^{-1} for all $x \epsilon R$. **(4)**

(d) Show that $(A \cup B)^c = A^c \cap B^c$. **(4)**

(e) Define homomorphic and isomorphic graph. **(4)**

(f) Define Tautology and Contradiction. **(5)**

Unit-I

Q2 (a) Let R and S be the following relations on: **(6)**
$B = \{a, b, c, d\}$, $R = \{(a, a), (a, c), (c, b), (c, d), (d, b)\}$ and
$S = \{(b, a), (c, c), (c, d), (d, d)\}$. Find the following composition relations.
(i) ROS (ii) SOR (iii) ROR (iv) SOS.

(b) Let $U = \{a, b, c, d, e\}$, $A = \{a, b, d\}$ and $B = \{b, d, e\}$.
Find (i) $A \cup B$ (ii) $B \cap A$ (iii) $B - A$ (iv) $A^c \cap B$ (v) $B^c - A^c$ **(6.5)**

Q3 (a) Let R be the relation in the natural numbers N = {1, 2, 3,.....} defined by the open sentence "$2x+y=10$", that is, let
$R = \{(x, y) \mid x \epsilon N,\ y \epsilon N,\ 2x + y = 10\}$.
Find: (i) the domain of R (ii) the range of R (iii) R^{-1}. **(6)**

(b) Among 50 students in a class, 26 got an A in the first examination and 21 got an A in the second examination. If 17 students did not get an A in the either examination, how many students got A in both the examination? **(6.5)**

Unit-II

Q4 (a) Let $B = \{2, 3, 4, 5, 6, 8, 9, 10\}$ be ordered by "x is a multiple of y". **(6)**
(i) Find all maximal elements of B.
(ii) Find all minimal elements of B.
(iii) Does B have a first or a last element?

(b) State whether or not each of the following subsets of N is totally ordered: **(6.5)**
(i) {24, 2, 6} (ii) {3, 15, 5} (iii) {15, 5, 30} (iv) {1, 2, 3,.....}.

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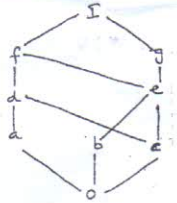
Q5 (a) Let R be the relation on A. **(6)**
$A = \{2, 3, 4, 6, 8, 12, 36, 48\}$.
$R = \{(a, b) \mid a \text{ is divisor of } b\}$. Draw Hasse diagram.

(b) Consider the lattice M is given below figure: **(6.5)**



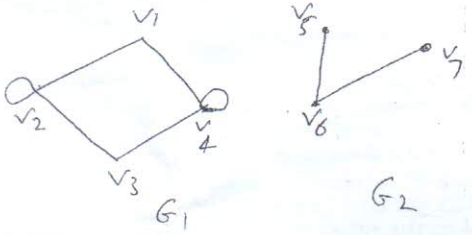
(i) Find complements of a and b, if exist.
(ii) Is M distributive? Complemented?

Unit-III

Q6 (a) Give an example of Isomorphic graphs. Show that the graph G_1 and G_2 are not isomorphic. **(6)**

G_1 G_2.

(b) Define Adjacent matrix. Find the adjacency matrix of the graph G. **(6.5)**



G_1 G_2

Q7 (a) Define (i) bipartite graph (ii) Hamilton Graph (iii) Cut-Vertical. **(6)**
(b) Draw the directed graph of following incidence matrix: **(6.5)**

	e_1	e_2	e_3	e_4	e_5	e_6
V_1	1	0	0	0	1	0
V_2	1	1	0	0	0	1
V_3	-1	0	0	0	0	1
V_4	0	0	1	1	0	1

Also find the degree of all vertex.

Unit-IV

Q8 (a) Construct the truth table of the following: **(6)**
(i) $(\sim p \vee q) V \sim p$
(ii) $(\sim q \rightarrow \sim p) \rightarrow (p \rightarrow q)$
(b) Verify whether following are tautologies or not: **(6.5)**
(i) $(q \rightarrow p) \leftrightarrow (\sim q \vee p)$
(ii) $(p \wedge (q - p)) \rightarrow p$

Q9 (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) What is the truth value of the quantification $(\exists x) Q(x)$, if the statement $Q(x)$ and inverse of discourse is given as follows: **(6.5)**
(i) $Q(x): x > 32$ U = {all real numbers}
(ii) $Q(x): x = x + 2$ U = {all real numbers}
(iii) $Q(x): x^2 < 12$ U = {positive integer not exceeding 3}.

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