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BICS-008

B.Tech. – VIEP – COMPUTER SCIENCE AND ENGINEERING (BTCSVI)

Term-End Examination

December, 2015

BICS-008 : DISCRETE MATHEMATICAL STRUCTURES

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any **five** questions. All questions carry equal marks.*

1. (a) Show that :

$$(A \times B) \times C \neq A \times (B \times C).$$ 7

(b) Let R be a binary relation defined as

$$R = \{ (a, b) \in R^2 \mid a - b \leq 3\}.$$

Determine whether R is reflexive, symmetric, or anti-symmetric. 7

2. (a) If in a group G, $a^5 = e$, $aba^{-1} = b^2$ for $a, b \in G$, find order(b). 7

(b) Prove that the product of disjoint cycles is commutative. 7

3. (a) Every field is an integral domain, prove it. 7

(b) If R is a ring such that $a^2 = a$, $\forall\ a \in R$, then prove that 7

(i) $a + a = 0\ \forall\ a \in R$

(ii) $a + b = 0 \Rightarrow a = b$

4. (a) Construct the truth table for $(P \rightarrow Q) \wedge (Q \rightarrow R)$. 7

(b) Prove that the pentagonal lattice is not modular. 7

5. (a) Show that $(P \vee Q) \wedge \neg Q \rightarrow P$ is a logical implication. 7

(b) Write the conjunctive normal form of the function $f(x, y, z) = (x + y)(x + z')$. 7

6. (a) Convert the DNF $xyz + xy'z + x'yz' + xy'z' + x'y'z'$ into CNF. 7

(b) Simplify the Boolean function : $F(x, y, z, w) = \sum (0, 1, 2, 3, 13, 15)$. 7

7. (a) Show that K_n has a Hamiltonian circuit whenever $n \geq 3$. 7

(b) Show that a simple graph G is a tree, iff there is one path between every pair of vertices. 7