| **BICS-008**

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

Term-End Examination

⊓⊓5⊐3   **December, 2016**

BICS-008 : DISCRETE MATHS STRUCTURE

Time : 3 hours   *Maximum Marks : 70*

Note : *Attempt any seven questions. All questions carry equal marks. All the questions are to be answered in English only.*

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1. (a) In a class of 100 students, 39 play tennis, 58 play cricket, 32 play hockey, 10 play cricket and hockey, 11 play hockey and tennis and 13 play tennis and cricket. Find the number of students who plays all the three games.   5

   (b) Use mathematical induction to show that

   $$n! \geq 2^{n-1}, n = 1, 2, 3, ...$$ 5

2. (a) Let Z be the set of integers. Show that the relation $R = \{(a, b) : a \equiv b \pmod{m}, a, b \in Z\}$ is an equivalence relation.   5

   (b) Let $f : \mathbf{R} \rightarrow \mathbf{R}$ be a real valued function defined by $f(x) = x^2, x \in \mathbf{R}$. Is f onto and invertible ? Give reasons.   5

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3. (a) Show that the union of two subgroups of a group is a subgroup of the group if and only if one subgroup is a subset of the other subgroup. *6*

   (b) Consider the multiplicative group $G = \{1, -1, i, -i\}$. Write the order of each element of this group. *4*

4. (a) Show that the set of even integers forms a ring under usual operations of addition and multiplication. *6*

   (b) Define Cyclic group and Normal subgroup with examples. *4*

5. (a) Find the truth table for a circuit whose Boolean sum-of-product expression is $t = xyz + xy'z + x'y$. *5*

   (b) Find the Boolean expression corresponding to the truth table $T(E) = 00010001$. *5*

6. Design a three-input-minimal AND-OR circuit with the following truth table : *10*

   T = [A, B, C; L] = [00001111, 00110011,
   01010101, 11001101]

7. Construct the truth tables for the following : *5+5*

   (a) $(p \lor q) \land \sim (p \land q)$

   (b) $(p \land q) \lor \sim r$

8. Show that the following argument is a fallacy :   *10*

If today is Ram's birthday, then today is May 18.

Today is May 18.

Therefore, today is Ram's birthday.

9. Solve the recurrence relation

$$a_n = 4a_{n-1} - 4a_{n-2}$$

with the initial conditions $a_0 = 1$, $a_1 = 1$.   *10*

10. Write short notes on any *two* of the following :   *5+5*

    (a) Binary Tree

    (b) Isomorphism of Graphs

    (c) Pigeonhole Principle

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