

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

Term-End Examination

00696

June, 2016

**BICS-008 : DISCRETE MATHEMATICAL
STRUCTURES**

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) A software company requires 60 engineers to perform Java programming jobs and 35 engineers to perform C++ programming jobs. Also 15 engineers are required to perform both types of jobs. How many engineers are to be appointed for the purpose? 5
- (b) Let A be a set of real numbers. Then show that the relation
- $$R = \{(a, b) : a = b, a, b \in A\}$$
- is an equivalence relation. 5

2. (a) Define one-one and onto functions. Give an example of a function which is one-one but not onto. Also write a function which is onto but not one-one. 5
- (b) Use mathematical induction to prove that $5^n - 1$ is divisible by 4, for all natural numbers n. 5
3. (a) Show that the intersection of two subgroups of a group G is again a subgroup of G. Give an example to show that the union of two subgroups of a group G need not be a subgroup of G. 6
- (b) Define ring and field with examples. 4
4. (a) Show that the order of every subgroup of a finite group divides the order of the group. 6
- (b) Prove that every group of prime order is cyclic. 4
5. (a) Find the truth table for a circuit whose Boolean sum-of-product expression is
- $$t = xyz + xy'z + x'y. \quad 5$$
- (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. Constructing a truth table, test the validity of the following argument : 10

If I study, I will not fail in Maths.

If I do not watch cricket, then I will study.

But I failed in Maths.

\therefore I must have watched cricket.

8. Construct truth tables for the following : 5+5

(a) $(p \vee q) \wedge \sim (p \wedge q)$

(b) $(p \wedge q) \vee \sim r$

9. Solve the recurrence relation : 10

$$a_n = 2a_{n-1} - a_{n-2}, \quad n \geq 2 \quad \text{with} \quad a_0 = 1, \quad a_1 = 4.$$

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

(a) Bipartite Graphs

(b) Planar Graphs

(c) Euler and Hamiltonian Paths