Total No. of Questions : 8]   [Total No. of Printed Pages : 2

Roll No ....

CS/IT-224 (CBCS)
B.E. III Semester
Examination, December 2017
Choice Based Credit System (CBCS)
Discrete Structure

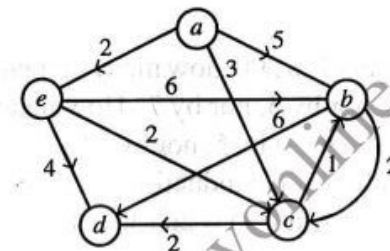*Time : Three Hours*

Maximum Marks : 60

Note: i) Attempt any five questions.
ii) All questions carry equal marks.

1. a) Among integers 1 to 300, how many of them are divisible neither by 3, nor by 5, nor by 7? How many of them are divisible by 3 but not by 5, nor by 7?

   b) Prove by mathematical induction:
   $1 + 4 + 7 + ... + (3n - 2) = 2n (3n - 1)$

2. a) Prove :
   i) $A \times (B \cap C) = (A \times B) \cap (A \times C)$
   ii) $A \times (B \cup C) = (A \times B) \cup (A \times C)$

   b) Explain Pigeonhole principle with an example.

3. a) Consider $G = \{1, 5, 7, 11\}$ under multiplication modulo 12
   i) Find the order of each element
   ii) Is G cyclic
   iii) Find all subgroups

   b) Define the following:
   i) Semigroup   ii) Monoid
   iii) Subgroup   iv) Ring

4. a) Differentiate between Homomorphism and Isomorphism of groups with an example.

[2]

   b) Show that following are Tautologies:
   i) $(p \wedge (p \rightarrow q)) \rightarrow q$
   ii) $(p \rightarrow q) \leftrightarrow (\sim p \vee q)$

5. a) Test the validity of argument:
   if it rains, Ram will be sick
   it did not rain
   ∴ Ram was not sick

   b) Explain universal and existential qualifiers with example.

6. a) Compute shortest path for the following graph between source a and destination d.

   b) What is graph coloring? Define chromatic number. Give any one example to explain your answer.

7. a) Explain briefly:
   i) Isomorphic graph
   ii) Euler graph

   b) Solve the following recurrence
   $t_n = 6t_{n-1} - 9a_{n-2}$
   Subject to initial conditions $a_0 = 1$ and $a_1 = 6$

8. Write short note on :
   a) Hasse diagram
   b) Lattices
   c) Binomial theorem
   d) Permutations

   ****** 29