

Roll No .....

**CS/IT-3005 (CBGS)****B.E. III Semester**

Examination, December 2017

**Choice Based Grading System (CBGS)****Discrete Structure**

Time : Three Hours

Maximum Marks : 70

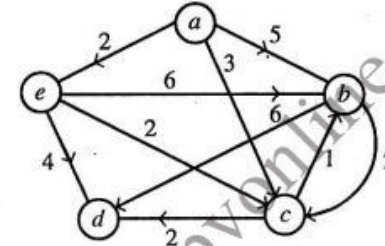
- Note:** i) Attempt any five questions.  
ii) All questions carry equal marks.

- 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?
  - Prove by mathematical induction:  
 $1 + 4 + 7 + \dots + (3n - 2) = 2n(3n - 1)$
- Prove :  
i)  $A \times (B \cap C) = (A \times B) \cap (A \times C)$   
ii)  $A \times (B \cup C) = (A \times B) \cup (A \times C)$
  - Explain Pigeonhole principle with an example.
- 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
  - Define the following:  
i) Semigroup                      ii) Monoid  
iii) Subgroup                      iv) Ring
- Differentiate between Homomorphism and Isomorphism of groups with an example.

- Show that following are Tautologies:  
i)  $(p \wedge (p \rightarrow q)) \rightarrow q$   
ii)  $(p \rightarrow q) \leftrightarrow (\sim p \vee q)$
- Test the validity of argument:  
if it rains, Ram will be sick  
it did not rain  

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 $\therefore$  Ram was not sick
- Explain universal and existential qualifiers with example.
- Compute shortest path for the following graph between source a and destination d.



- What is graph coloring? Define chromatic number. Give any one example to explain your answer.
- Explain briefly:  
i) Isomorphic graph  
ii) Euler graph
- Solve the following recurrence  
 $t_n = 6t_{n-1} - 9a_{n-2}$   
Subject to initial conditions  $a_0 = 1$  and  $a_1 = 6$
- Write short note on :  
a) Hasse diagram  
b) Lattices  
c) Binomial theorem  
d) Permutations