Roll No. .....

24041

B. Tech. 3rd Sem. (IT)

Examination – December, 2015

DISCRETE STRUCTURE

Paper : CSE-203-F

Time : Three Hours] *[Maximum Marks : 100*

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Question No. 1 is ***compulsory***. Attempt ***five*** questions with selecting ***one*** question from each Section **(A-D)**. All questions carry equal marks.

1. (a) Determine the power set P(A) of the following sets :

(i) A={1,2,3} (ii) A={a,{a}}

(b) Define Cartesian product of sets and Multisets.

(c) Consider the following relation R on the set of positive integers. Find its inverse :

R={(1,1), (1,2), (1,3),(2,1),(3,1),(3,2),(2,3)}.

(d) If $f(x) = x^2 - 3x + 4$, then find the value of x satisfying the equation $f(x) = f(2x + 1)$.

(e) There are 10 persons called on an interview. Each one is capable to be selected for the job. How many permutation are there to select 4 from the 10.

(f) Show that the identity element in a group is unique.

(g) Define proposition and tautology.

(h) What do you mean by ordered trees and rooted trees ?

SECTION – A

2. (a) Discuss equivalence relation and equivalence class with the help of examples.

(b) Consider the function $f, g : R \to R$ defined by $f(x) = x^2 + 3x + 1, g(x) = 2x - 3$ find the composition functions (i) *fof* (ii) *fog* (iii) *gof*.

3. (a) Prove the following statements analytically, where A, B and C are arbitrary sets :

(i) $(A \cap B) - C = (A - C) \cap (B - C)$

(ii) $A - B = A \cap B^C$

(iii) $(A \oplus B)^C = A^C \oplus B = A \oplus B^C$

(iv) $(A - B) \subseteq A$

(v) $(A - B) \cup (B - A) = (A \cup B) - (A \cap B)$

(b) From the following formulae, find out tautology, contingency and contradiction,

(i) $A \cong A \wedge (A \vee B)$

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

(iii) $\sim (p \vee q) \vee (\sim p \vee \sim q)$

SECTION – B

4. (a) Determine the number of triangles that are formed by selecting point from a set of 15 points out of which 8 are collinear.

(b) In how many ways can 5 software projects be allotted to 6 final year student when all the 5 projects are not allotted to the same student ?

(c) How many 2-digits even numbers can be formed by using the digits 1,3,4,6,8 when repetition of digits is allowed.

5. (a) Solve the recurrence relation $a_r = a_{r-1} + 2a_{r-2}$ with $a_0 = 2$ and $a_1 = 10$.

(b) Define Recurrence relation, order of the Recurrence relation and Degree of the recurrence relation with suitable examples.

SECTION – C

6. (a) Define and explain Monoid and submonoid with example.

(b) Let G_1 and G_2 be subgroups of a group G(i) show that $G_1 \cap G_2$ is also a subgroup of G. (ii) is $G_1 \cup G_2$ always a subgroup of G ?

7. Explain integral Domain, Field, Cosets and Cyclic groups with example.

SECTION – D

8. Explain the following :

(a) Directed and Undirected graphs.

(b) Cut points and Bridges

(c) Multigraphs and weighted graphs

(d) Shortest paths in weighted graphs.

9. (a) Show that a regular binary tree has an odd number of vertices.

(b) Write the possible two algorithms to find a minimal spanning tree of a graph G.
