



Name of the Institute: SIT

Batch: 2011-15

Programme Name: B.Tech.

Semester: III

Programme Code: 070121

Course Name: Discrete Structures (CS & IT)

Maximum Marks: 75

Course Code: 0701211301, 0701213301

Date: 26/11/2013

Time: 01.30 PM to 04.30 PM

Day: Tuesday

### Instructions:

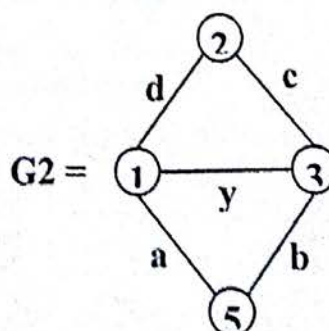
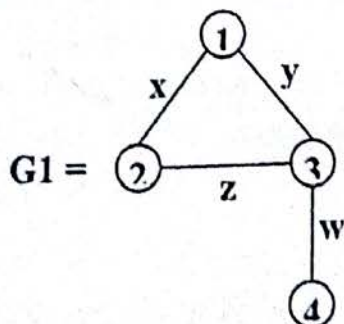
1. All questions from Part A are compulsory.
2. Attempt any four questions from Part B.
3. Only non programmable calculators are allowed.

### PART A

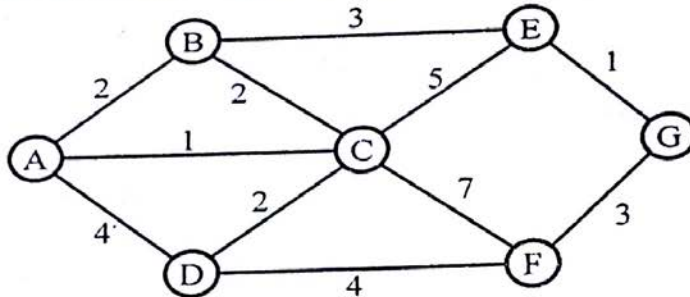
- Q. 1**
- |    |  |   |
|----|--|---|
| a) | Define the terms i) Multi Set ii) Binary search tree iii) Hamoltonian circuit  | 3 |
| b) | If $U = \{n \in \mathbb{N} / 1 \leq n \leq 9\}$ $A = \{1, 2, 4, 6, 8\}$ $B = \{2, 4, 5, 9\}$ $C = \{x \in \mathbb{N} / x^2 \leq 16\}$ & $D = \{7, 8\}$ Find: i) $C - D$ ii) $B \oplus C$ | 4 |
| c) | Prove that $(A, R)$ is poset and draw its Hasse Diagram for $m = 24$ where $R$ is a divides relation.  | 4 |
| d) | Draw a Venn diagram for: $(A \cup \bar{B}) \cap (A \cup C)$  | 4 |
| e) | Given the truth values of $p$ and $q$ as T and that of $r$ and $s$ as F, find the truth value of: $\sim((p \vee q) \wedge (r \vee s))$   | 4 |
| f) | Which trees are complete bipartite graphs? Explain in detail.  | 4 |
| g) | How many different arrangements can be formed of the letters in the word 'PIONEER' if two E's are always together  | 4 |

### PART B

- Q. 2** a) Find the union and ring sum of the following graphs 6



- b) Find the shortest path using Dijkstra's algorithm from A to G.



- Q. 3 a) How many people at least in a group of 85 have the same initial of the last name? 4
- b) If a person wants to purchase 16 cans of soft drinks, how many different selections can be made if the shop has only four different types? 4
- c) In how many ways can a committee of 5 teachers and 4 students be chosen from 8 teachers and 14 students? 4

- Q. 4 a) It was found that in first year computer science of 80 students 50 know Java, 55 know C++, and 46 know oracle. It was also known that 37 know java and C++. 28 know C++ and oracle, 25 know java and oracle .7 students however know none of the languages. Find: 6
- i) How many know all the three languages?
- ii) How many know exactly one language?
- b) Obtain CNF and DNF of :  $[p \wedge (p \rightarrow q)] \rightarrow q$  6

- Q. 5 a) Prove that  $1^2 - 2^2 + 3^2 - 4^2 + \dots + (-1)^{n-1} n^2 = (-1)^{n-1} \frac{n(n+1)}{2}$  6
- b) Write all elements of  $S_3$  and group table of  $S_3$ . 6

- Q. 6 a) Let  $f(x) = x^2 + 1$ ,  $g(x) = x - 3$ ,  $h(x) = 2x$  for all  $x$  in  $\mathbb{R}$ , where  $\mathbb{R}$  = set of all real numbers. Find fog, gof, fogoh, hohoh 6
- b) Find the total solution of  $a_n - a_{n-1} = 2a_{n-2} + 2n^2$  6