



Institute: (0701) SYMBIOSIS INSTITUTE OF TECHNOLOGY, PUNE  
Programme: (070121) B.TECH  
Computer Science & Information Technology  
Batch: 2013-17  
Semester: III  
Course: Discrete Structures  
Course Code: 0701210301CS , 0701210301IT

Date: 09/12/2014  
Day: Tuesday

Maximum Marks: 60  
Time: 01:30 pm - 04:00 pm

**Instructions:**

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

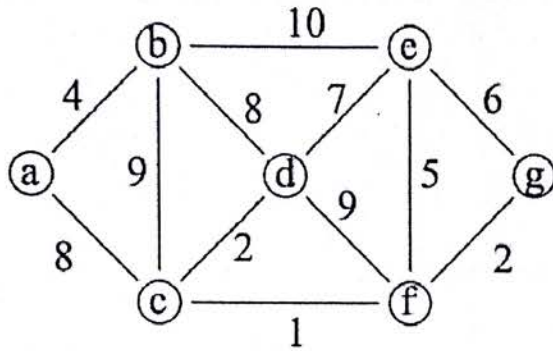
**PART - A**

- Q. 1
- a. Construct the truth table for  $(p \rightarrow (q \rightarrow s)) \wedge (\sim r \vee p) \wedge q$  4
  - b. Let  $f(x) = x^2 + 1$ ,  $g(x) = x + 2$ , for  $x$  in  $R$ , where  $R =$  set of real numbers. Find  $\text{gof}(3)$ ,  $\text{fog}(3)$ . 2
  - c. Explain with example the terms subgraph and spanning sub graph 4
  - d. How many people must you have to guarantee that at least 9 of them will have birthdays in the same day of the week? 2
  - e. Describe the binary search tree and draw binary search tree for the following sequence: J, R, D, G, W, E, M, H, P, A, F, Q 4
  - f. Determine the no of regions defined by a connected planer graph with 6 nodes and 10 edges. Draw one such simple and multiple graph. 4
  - h. From 10 engineers in how many ways can 5 be selected when:  
i) A particular engineer is included every time. 4  
ii) A particular programmer is not included at all.

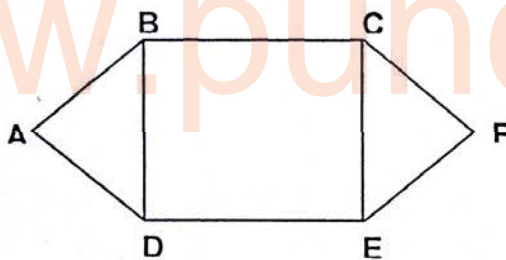
**PART - B**

- Q. 2
- a. Determine the no. of permutations that can be made out of the letters of the word 'PROGRAMMING' 3
  - b. A card is drawn at random from a well-shuffled pack of 52 cards. Find the probability of getting a jack, a queen or a king. 3
  - c. How many permutations of the letters A, B, C, D, E, F, G contains:  
i) The string BCD? 6  
ii) The string CBA and DE?  
iii) The strings CBA and BDE?

- Q. 3 a. Using mathematical induction show that  $n^3 - n$  is divisible by 3 for a positive integer  $n$ . 4
- b. Solve  $a_r = a_{r-1} + 6a_{r-2} - 30$ ; given  $a_0 = 20$  and  $a_1 = -5$ . 4
- c. Let  $S = \{A, B, C\}$  &  $R = \{(A, A), (A, C), (B, B), (C, A), (C, B)\}$  Use Warshall's Algorithm to find the transitive closure  $R^*$ . 4
- Q. 4 a. Determine a cost of a minimum spanning tree in the following graph using Prim's algorithm. 4



- b. Define the complete graph and find the union and Intersection of two complete graphs  $K_3$  and  $K_4$ . 4
- c. Describe the path in graph in detail and find all the elementary paths from A to F in the given graph. 4



- Q. 5 a. In the second year engineering there are 130 students, 51 studies C, 60 studies C++ and 30 studies both. Out of 54 students studying JAVA, 21 study C, 26 studies C++ and 12 studies both. All the students studying neither C nor C++ are studying .NET. Find: 6
- How many are not studying .NET?
  - How many not studying JAVA are studying C++ but not C?
  - How many students are studying neither C nor C++ nor JAVA?
- b. Find the shortest path using Dijkstra's algorithm from a to z. 6

