Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V • EXAMINATION – SUMMER • 2015

Subject code: 150703 **Date: 11/5/2015**

Subject Name: Design and Analysis of Algorithms

Time: 02.30pm-05.00pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** Explain following terms with example. **06**

1. Set
2. Relation
3. Function

(b) Do as directed.

1. Calculate computation time for the statement t3 in following code fragment? **04**

```
for i = 1 to n
{     for j = 1 to i
      {
        c = c + 1 …..…… t3
      }
}
```

2. Prove that $T(n) = 1+2+3+\ldots+n = \Theta(n^2)$. **04**

Q.2 **(a)** Write an algorithm for insertion sort. **03**

Analyze insertion sort algorithm for best case and worst case. **04**

(b) Define an amortized analysis. Briefly explain its different techniques. **04**

Carry out aggregate analysis for the problem of implementing a k-bit binary counter that counts upward from 0. **03**

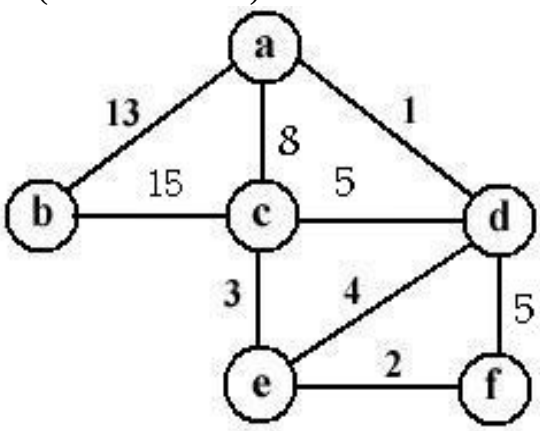
OR

(b) Analyze quick sort algorithm for best case, average case and worst case with example. **06**

In which case it performs similar to selection sort? **01**

Q.3 **(a)** Mention applications of minimum spanning tree. **02**

Generate minimum spanning tree from the following graph using Prim's algorithm. (Start at vertex a) **05**



(b) Discuss matrix multiplication problem using divide and conquer

technique. **07**

OR

Q.3 **(a)** Following are the details of various jobs to be scheduled on multiple processors such that no two processes execute at the same on the same processor.

Jobs	J_1	J_2	J_3	J_4	J_5	J_6	J_7
Start time	0	3	4	9	7	1	6
Finish time	2	7	7	11	10	5	8

Show schedule of these jobs on minimum number of processors using greedy approach. **03**

Derive an algorithm for the same. **03**

What is the time complexity of this algorithm? **01**

(b) Answer the following questions.

1. What are the differences between greedy approach and dynamic programming? **03**
2. Explain class P and class NP. **04**

Q.4 **(a)** Find an optimal solution to the knapsack instance n=4, M=8, (P1,P2,P3,P4)=(3,5,6,10) and (W1,W2,W3,W4)=(2,3,4,5) using backtracking. **04**

Also draw the corresponding state space tree. **03**

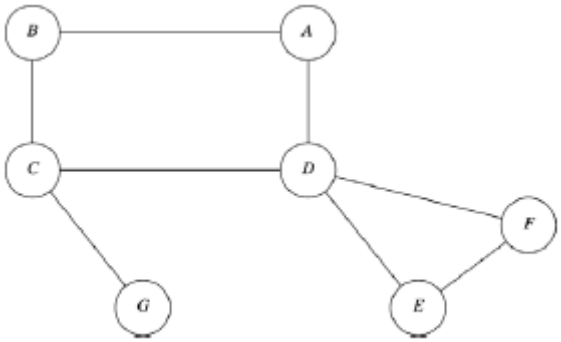
(b) What is finite automata? **02**

Explain with example how finite automaton is used for string matching? **05**

OR

Q.4 **(a)** Write an algorithm to find out the articulation points of an undirected graph. **03**

Find out articulation points for the following graph. Consider vertex A as the starting point. **04**



(b) Explain spurious hits in Rabin-Karp string matching algorithm with example. **02**

Working modulo q=13, how many spurious hits does the Rabin-Karp matcher encounter in the text T = 2359023141526739921 when looking for the pattern P = 31415? **05**

Q.5 **(a)** Generate equation for Matrix chain multiplication using Dynamic programming. **02**

Find out minimum number of multiplications required for multiplying: A[1 × 5], B[5 × 4], C[4 × 3], D[3 × 2], and E[2 × 1]. **04**

Also give the optimal parenthesization of matrices. **01**

(b) Discuss and derive an equation for solving the 0/1 Knapsack problem using dynamic programming method. Design and analyze the algorithm for the same. **07**

OR

Q.5	**(a)**	Discuss and derive the optimal substructure that can be used to solve the Longest Common Subsequence problem using dynamic programming.	**03**
		Find the longest common subsequence for the given two sequences of characters: P = (1,0,0,1,0,1,1,0,1,1,0,1); Q= (0,1,1,0).	**04**
	(b)	Discuss Assembly Line Scheduling problem using dynamic programming with example.	**07**

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