



Name : .....

Roll No. : .....

Invigilator's Signature : .....

**CS/M.TECH (CSE)/SEM-1/MCSE-104/2011-12**

**2011**

**ADVANCED DESIGN & ANALYSIS  
OF ALGORITHM**

Time Allotted : 3 Hours

Full Marks : 70

*The figures in the margin indicate full marks.*

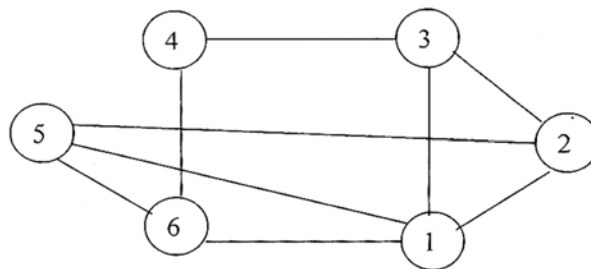
*Candidates are required to give their answers in their own words  
as far as practicable.*

**GROUP – A**

**(Short answer type question)**

1. Answer the following questions :  $5 \times 2 = 10$

- a) What is the difference between Prim's and Kruskal's algorithm ?
- b) What is the Hamiltonian Cycle of the following graph ?



- c) Explain Breadth First Algorithm with an example.
- d) What is a Lossy data compression ? Give few examples where this type of compression is used.
- e) Describe a closest pair problem.



**GROUP – B**  
**(Long answer type questions)**

Attempt any *four* questions.

4 × 15 = 60

2. a) Write down Strassen's Matrix Multiplication algorithm.  
What is the complexity of this algorithm and how it is better than standard matrix multiplication ? 4 + 3
- b) What is a Heap ? Write an algorithm to insert an element in a heap. 2 + 3
- c) Write down an algorithm to reverse a single linked list, where the last node of the list will be the first node after reversing. 3
3. a) Hoare Partition algorithm is used to sort a list of element using quick sort. Write down Hoare Partition algorithm.  
  
Hence show how the values of the array  $a[] = \{ 13, 19, 9, 5, 12, 8, 4, 11, 2, 21 \}$  will be organized, when this function is called with the first number as pivot number. 4 + 3
- b) Find out the time complexity of the following using recursion.  
$$T(n) = T(n/2) + c \times n$$
 4
- c) Write down an algorithm to delete an item from binary search tree. 4



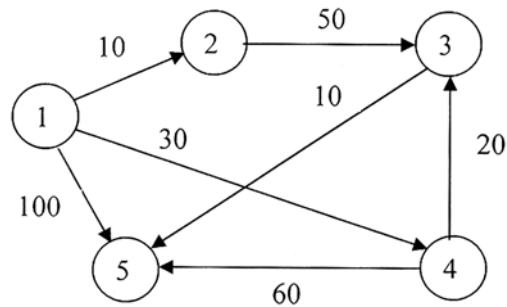
4. a) Discuss diagrammatically the relation among P class, NP class, NP hard, NP complete. 4
- b) Describe Clique Decision problem and prove that it is NP complete. 6
- c) Write down a non-deterministic graph colouring algorithm. 5
5. a) Define Greedy Job Scheduling problem. Following table shows profit and deadline of a list of 5 jobs. Write down the algorithm and schedule the jobs based on the algorithm. 2 + 4 + 3

Job Name	Profit	Deadline
A	100	2
B	19	1
C	27	2
D	25	1
E	15	3

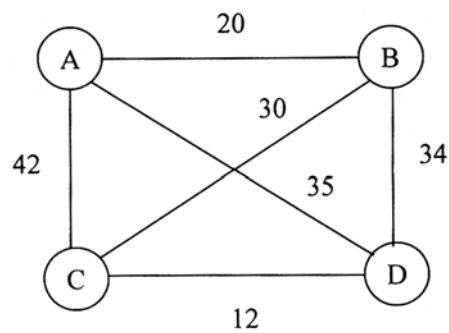
- b) What is the difference between Greedy and Dynamic Programming ? 2
- c) Write down Knuth-Morris-Prat pattern matching algorithm. 4
6. a) What is Approximation Algorithm ? Prove the Bin Packing problem is NP hard. 2 + 4
- b) Explain how Polynomial time approximation scheme is used on scheduling independent tasks. 4
- c) What is convex hull ? Write an algorithm that implements Quick Hull. 2 + 3



7. a) Write down Bellmanford Algorithm to calculate shortest path from a source. Find out the shortest path from the source node 1 in the following graph. 4 + 4



- b) A salesman has to travel to few cities as described in the following graph. Find out the route the salesman should follow to achieve minimum travel starting from city A. 4



- c) Write an algorithm of Matrix Chain multiplication. What is the complexity of this algorithm ? 3

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