

- (b) Solve the following instance of the 0/1 knapsack problem given the knapsack capacity is $W = 5$.

Items	Weight	Value
1	2	12
2	1	10
3	3	20
4	2	15

- (c) What is Hamiltonian Problem? Explain with an example using back tracking.
6. Attempt any two parts of the following :
- (a) Explain the algorithm for finding all m-colorings of a graph.
- (b) For the following graph having four nodes represented by the matrix given below. Determine the all pairs shortest path :

0	∞	3	∞
2	0	∞	∞
∞	7	0	1
6	∞	∞	0

- (c) Explain the need for approximation algorithms and how they can be used for NP hard problems.

No. of Printed Pages : 04

Following Paper ID and Roll No. to be filled in your Answer Book.

PAPER ID : 21201	Roll								
	No.								

MCA Examination 2018-19
(Third Semester)

ANALYSIS AND DESIGN OF ALGORITHM

Time : Three Hours

Maximum Marks : 60

Note :- Attempt all questions.

SECTION - A

1. Attempt all parts of the following : $8 \times 1 = 8$
- (a) Define Big 'Oh' notation.
- (b) What is meant by Linear Search?
- (c) What is the drawback of greedy algorithm?
- (d) Define post-order tree traversal.
- (e) State the principle of optimality.
- (f) What is Graph Cloning?

- (g) What is the time complexity of binary search?
 (h) What is Chromatic Number?

SECTION - B

2. Attempt any two parts of the following: $2 \times 6 = 12$
 (a) Explain the method of solving recurrence equation with a suitable example.

- (b) What is Binary Search? Trace the operation of the binary search algorithm for the input

-15, -3, 0, 6, 9, 23, 57, 101, 117, 125, 131, 142, 155

If you are searching for the element 9.

- (c) Explain how greedy method can be applied to solve the Knapsack problem?
 (d) Discuss in detail about the biconnected components of a graph.

SECTION - C

Note :- Attempt all questions. $10 \times 4 = 40$

3. Attempt any two parts of the following:
 (a) Prove that for any two functions $f(n)$ and $g(n)$, we have $f(n) = \theta(g(n))$ if and only if $f(n) = O(g(n))$ and $f(n) = \Omega(g(n))$.

- (b) Solve the following recurrence equations completely:

(i) $T(n) = \sum_{i=1}^{n-1} T(i) + 1, \text{ if } n \geq 2$

$T(n) = 1, \text{ if } n = 1$

(ii) $T(n) = 5T(n-1) - 6T(n-2)$

- (c) Compare and contrast quick sort and merge sort. Arrange the following numbers in increasing order using merge sort:

18, 30, 65, 33, 45, 91, 21, 49, 55

4. Attempt any two parts of the following:

- (a) (i) Explain the properties of binomial tree.

- (ii) Why don't we allow a minimum degree of $t = 1$ for B-tree.

- (b) Discuss the weighted union procedure for data structure for disjoint set and how to improve its worst case complexity.

- (c) What are the basic steps in augmenting? Augment a BST.

5. Attempt any two parts of the following:

- (a) How is dynamic programming applied to solve the travelling sales person problem? Explain in detail with an example.

[P.T.O.]