

END SEMESTER EXAMINATION, JUNE - 2019
MCA FOURTH SEMESTER

COURSE CODE: MCA209	COURSE TITLE: DESIGN & ANALYSIS OF ALGORITHMS
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[Time allotted: Three hours]**[Max. Marks: 100]***Note: Attempt all Sections & Questions.*

Section (A)

Attempt all questions.**(2 x 10 = 20)**

- Q.1.**
- a. Give advantages of recursion over iteration.
 - b. Define all-pair shortest path problem?
 - c. Define minimum spanning tree?
 - d. Differentiate 0/1 knapsack problem from fractional knapsack problem.
 - e. What is Balance factor in AVL Trees?
 - f. What is a decision problem?
 - g. Differentiate FIFO branch and bound from LIFO branch and bound.
 - h. Define Hamiltonian cycle problem.
 - i. Define NP problem.
 - j. Write algorithm for topological sorting

Section (B)

Attempt any 5 questions.**(7 x 5 = 35)**

- Q.2.**
- a. On the given input array, show the execution of quicksort algorithm:
(Assume first element as pivot element)

3	7	8	5	2	1	9	5	4
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- b. Insert the following sequence of elements into an AVL tree, starting with an empty tree:
10, 20, 15, 25, 30, 16, 18, 19.
- c. Find the prefix code of each character (using Huffman coding) from the data given below:

Character	A	B	C	D	E	F	G
Frequency	37	18	29	13	30	17	6

- d. Define Heap and various operations performed on heap.
- e. From the given sequence of dimensions find optimal parenthesization:
< 5, 4, 6, 2, 7 >
- f. Explain branch & bound using an example problem.
- g. What characteristics a problem must exhibit so that it can be solved by Greedy algorithm? Explain with a problem.

Section (C)

Attempt any 3 questions.**(15 x 3 = 45)**

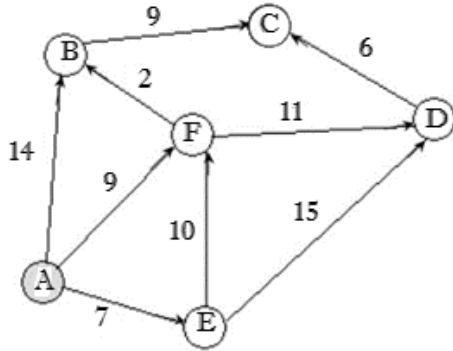
- Q.3.**
- a. Explain asymptotic notations.
 - b. Solve the recurrence using repeated substitution method:

(7)**(8)**

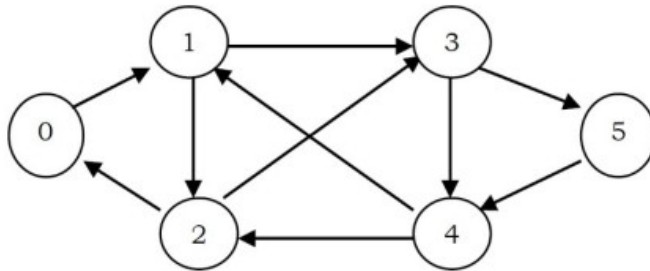
$$T(n) = T(n-1) + cn \quad n > 1$$

$$T(1) = 1$$

- Q.4.** a. Discuss Heap and operations supported by heap. (7)
 b. For the given graph find the shortest path from vertex A using Dijkstra's algorithm. (8)



- Q.5.** a. What are the implicit and explicit constraints for the subset-sum problem? Also build the state-space tree for fixed size tuple formulation of subset-sum problem for the given data: (7)
 $n=4; \{w_1, w_2, w_3, w_4\} = \{11, 13, 24, 7\}; m=31$
 b. Find the BFS traversal of given graph. Show the status of Data structure used. (8)



- Q.6.** a. Show that following inequalities are incorrect (7)
 i. $10n^2 + 9 = O(n)$
 ii. $n^2 \log n = \Theta(n^2)$
 b. Describe reliability design problem in detail. (8)

- Q.7.** a. Write short note on Complexity classes P, NP, NPC, NP-Hard. (7)
 b. Consider the given Text and Pattern: (8)
 T: b a c b a b a b a c a a b
 P: a b a b a c a
 Show the execution of KMP algorithm to find whether 'P' occurs in 'T'.
