

END SEMESTER EXAMINATION, JUNE - 2019
BCA FOURTH SEMESTER

COURSE CODE: BCA208**COURSE TITLE: DESIGN & ANALYSIS OF ALGORITHMS****[Time allotted: Three hours]****[Max. Marks: 100]***Note: Attempt all Sections.*

Section (A)

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

- Q.1.**
- Explain Big-Ω notation.
 - Define all-pair shortest path problem? What is the running time of the Dynamic Programming (DP) solution of all-pair shortest path problem given by Floyd Warshall algorithm?
 - Define minimum spanning tree?
 - Differentiate 0/1 knapsack problem from fractional knapsack problem.
 - What is Balance factor in AVL Trees?
 - Explain Tail Recursion.
 - Differentiate FIFO branch and bound from LIFO branch and bound.
 - Define Hamiltonian cycle problem.
 - Define Heap and list operations performed on heap.
 - Build the recursion tree of finding factorial of a number.

Section (B)

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

- Q.2.**
- On the given input array, show the array instance till first partition using quicksort: (Assume first element as pivot element)

3	7	8	5	2	1	9	5	4
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- Insert the following sequence of elements into an AVL tree, starting with an empty tree:
12, 21, 16, 26, 32, 17, 19, 20.
- Find an optimal solution of following jobs whose profits and deadlines given in table.

Job	J1	J2	J3	J4	J5
Profit	60	100	20	40	20
Deadline	2	1	3	2	1

- Formally define a B-Tree.
- From the given sequence of dimensions find minimum number of scalar multiplications:
< 5, 4, 6, 2, 7 >
- Explain backtracking using an example problem.
- What characteristics a problem must exhibit so that it can be solved by Greedy algorithm? Explain with a problem.

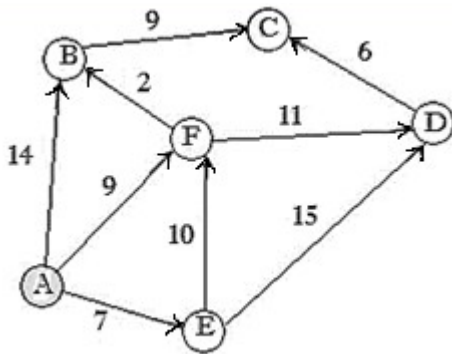
Section (C)

Attempt any 3 questions

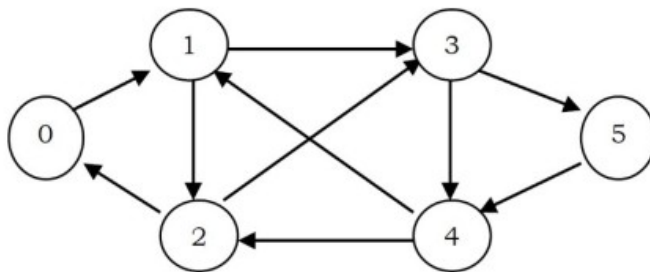
(15 x 3 = 45)

- Q.3.**
- Explain asymptotic notations. (7)
 - Solve the given recurrence, using repeated substitution method: (8)
 $T(n) = 2T(n/2) + cn \quad n > 1$
 $T(1) = d$

- Q.4.**
- Let $f(n) = 2^{n+1}$ and $g(n) = 2^n$. Whether $f(n)$ is $O(g(n))$ or $f(n)$ is $\Omega(g(n))$ or $f(n)$ is $\Theta(g(n))$. Give Proof. (7)
 - For the given graph find the shortest path from vertex A using Dijkstra's algorithm. (8)



- Q.5.**
- Write down the Top-down DP solution for calculating n^{th} Fibonacci number. (7)
 - Find the BFS traversal of given graph. Show the status of Data structure used. (8)



- Q.6.**
- Assuming all edges being undirected, find the MST for the graph in question 4.b. using Prim's algorithm. (7)
 - Describe Reliability design problem in detail. (8)
- Q.7.**
- For the following code find the output when fun is called by value $x=5, y=2$. (7)
 (Show the function calls and value returned by each function call using recursion tree): (8)

```

int fun(int x, int y){
    if(x == 0) return y;

```

else return fun(x - 1, x + y); }

- b. Starting with an empty tree, insert the following keys into B-tree of degree 3:
5, 16, 22, 45, 2, 10, 18, 30, 50, 12, 31
