

# UKA TARSADIA UNIVERSITY

B.Tech (CE)/B.Tech (IT) ( Semester 5 )  
030080503(2017-18)/030090503(2017-18)  
Design and Analysis of Algorithms

Date :11/11/2019

Time :9:30AM- 12:30PM  
Max. Marks:60

## Instructions :

1. Attempt all questions.
2. Write each section in a separate answer book.
3. Make suitable assumptions wherever necessary.
4. Draw diagrams/figures whenever necessary.
5. Figures to the right indicate full marks allocated to that question.
6. Follow usual meaning of notations/abbreviations.

## SECTION - 1

Q 1 A) Sort the list using merge sort algorithm: 10, 20, 16, 29, 39, and 15. What will be the time complexity to sort this list? [6]

OR

Q 1 A) Explain how divide and conquer method help multiplying two large integers and also find its run time complexity.

Q 2 A) Answer the following in brief. (Any 3) [6]

I) Justify: If  $f(n) = 2n^3 + 3n^2 + 1$  then  $f(n)$  is not equal to  $O(n^2)$ .

II) Why analysis of an algorithm is important? Justify your answer.

III) Find the asymptotic lower bound for  $f(n) = n^3 + 20n$ . Also compute  $c$  and  $n_0$ .

IV) Prove or disprove:  $f(n) + O(f(n)) = \Theta(f(n))$ .

Q 2 B) Solve following recurrences using master method: [6]

- i.  $T(n) = 2^n T(n/2) + n^n$
- ii.  $T(n) = 4T(n/2) + n^2 \log n$
- iii.  $T(n) = 4T(n/3) + n \log n$

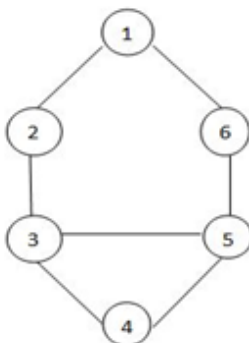
OR

Q 2 B) Solve following recurrence relation using recursive tree method.

$$T(n) = 3T(n/3) + n^2$$

Q 3 A) Answer the following in brief. (Any 1) [2]

I) Count the total number of spanning trees generated from given graph.



Edges

$C_{n-1}$  - no of cycles

$$\sum_{i=1}^7 C_i - 2$$

II) Explain problems of greedy approach with an example

**Q 3 B) Answer the following in detail. (Any 2)**

[10]

- I) Solve the fractional knapsack problem for five items whose weights and values are given in following arrays:

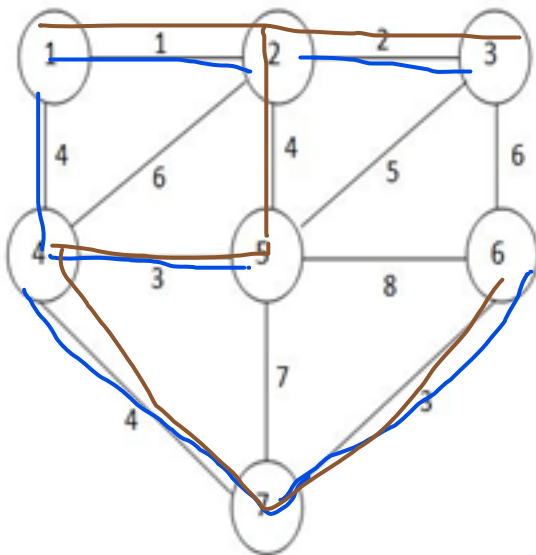
Weight  $W[] = \{5, 10, 20, 30, 40\}$

Value  $V[] = \{30, 20, 100, 90, 160\}$

Find the optimal knapsack items for weight capacity of 60 units. Write time complexity of it.

*Knapsack*

- II) Generate minimum spanning tree for the following graph using Kruskal's algorithm:



*Kruskal*

*Job Sch*

- III) Write job scheduling algorithm Consider the following jobs, deadlines and profits. Use scheduling to maximize total profit.

Jobs	j1	j2	j3	j4	j5
Deadline	2	1	3	2	1
Profit	60	100	20	40	20

SECTION - 2

**Q 4 A) Answer the following in brief (Any 1)**

[2]

- I) Define: Computational complexity and Optimization problem.

- II) When a problem is said to be NP hard?

*NP hard*

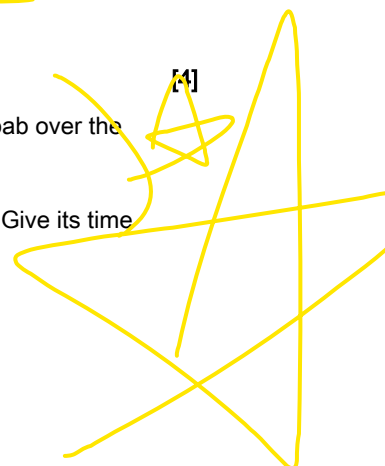
**Q 4 B) Answer the following (Any 1)**

[4]

- I) Draw the state transition diagram for string matching automaton for the pattern  $P = ababbab$  over the alphabet  $\Sigma = \{a, b\}$ .

- II) Apply Rabin-Karp algorithm on text  $T = 31415926535$  and pattern  $P = 26$  with modulo  $q = 11$ . Give its time complexity also.

*RK*



Q 5 A) Answer the following in brief. (Any 1)

[2]

I) Define:

(a) State space

(b) Directed acyclic graph.

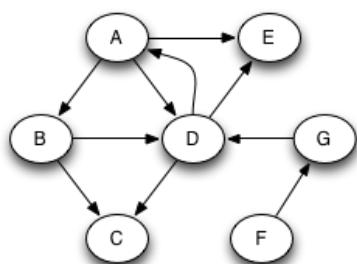
II) Explain minmax principle.

Q 5 B) Answer the following in detail. (Any 2)

[10]

I) Illustrate the progress of breadth-first search on the graph given below.

Here A is the starting vertex.



*BFS*

*Knapsack*

II) Consider the following instances for Knapsack problem using backtracking with  $n=3$  units.

$P(25,24,15)$   $W(18,15,10)$   $M=20$ . Give the state space tree for the above problem.

*B&B*

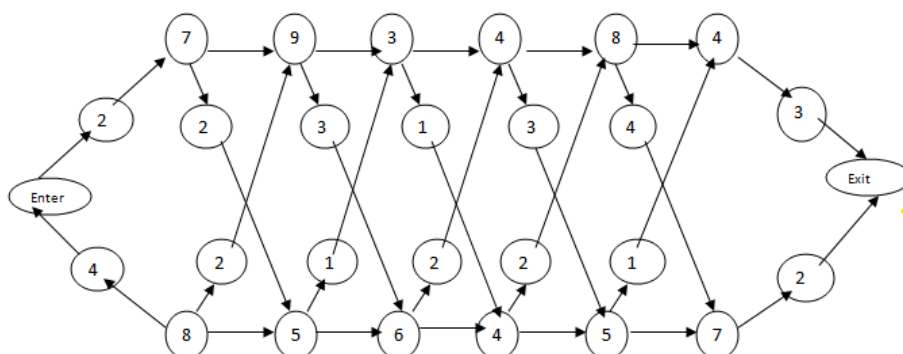
III) Use branch and bound method to solve the assignment problems using the given cost matrices:

	1	2	3	4
a	11	12	18	40
b	14	15	13	22
c	11	17	19	23
d	17	14	20	28

Q 6 Answer the following in detail. (Any 2)

[12]

I) What station should be chosen from line 1 and which from line 2 in order to minimize the total time through the factory for one auto?



*Make Change DP*

II) Solve making change problem using dynamic programming, where  $d1=1$ ,  $d2=4$ ,  $d3=6$  coins,  $n=3$  items and make a change for  $N=8$  units.

III) Explain how to find out longest common subsequence of two strings using dynamic programming method. Find longest common subsequence from the given two strings.

A = abcdef

B = acbcf

*LCS*