53 (CS 503) DAAL

2018

DESIGN AND ANALYSIS OF ALGORITHM

Paper : CS 503

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

Answer ***any five*** *questions.*

1. Consider the two cases of the merge sort algorithm —

   (a) splitted from the middle

   (b) splitted one element in one half and the rest are in other half.

   Compute the time complexity for both the cases and show which one is better than the other in terms of time complexity. 20

2. *(a)* Design a greedy algorithm for the fractional knapsack problem. Discuss with an example.

(b) Show that your algorithm is not suitable for 0/1 knapsack problem. Discuss with an example.

10+10

3. *(a)* Write a dynamic programming based algorithm for computing the Fibonacci series.

(b) Compute the time complexity of your algorithm.

(c) Justify whether your algorithm is better than the following algorithm.

$fib(n) = fib(n-1) + fib(n-2)$ if $n > 1$

$= 1$ if $n = 1$

$= 0$ if $n = 0$.

5+5+10

4. *(a)* Define the terms :

(i) NP

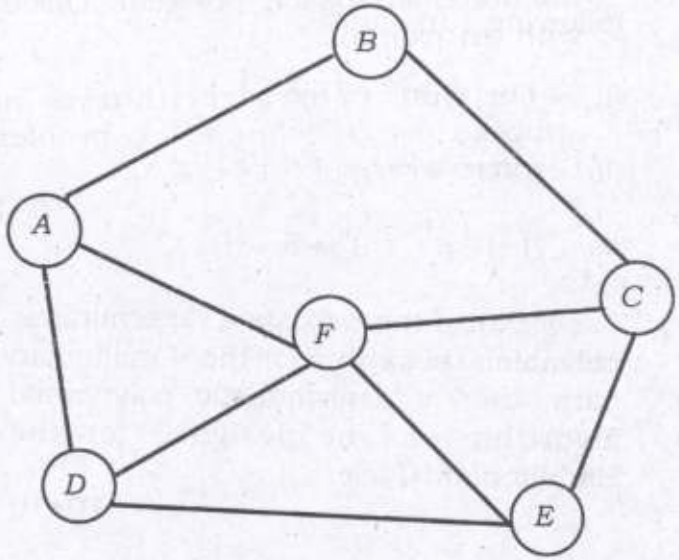
(ii) NP hard

(iii) NP complete.

(b) Show that 2-SAT is not NP complete.

10+10

5. Consider the following graph.



(a) Perform BFS and DFS.

(b) Consider the following distance matrix for the TSP problem.

	A	B	C	D	E
A	0	7	3	2	1
B	7	0	5	4	3
C	3	5	0	2	9
D	2	4	2	0	4
E	1	3	9	4	0

Use branch and bound technique to solve the TSP problem. 5×2+10

6. *(a)* Compute the big O and Θ for the following functions.

(i) $f(n) = 3n^2 + 7 - 5$

(ii) $g(n) = n\log_2 n + n + 11$

(iii) $l(n) = n^{10} + 2^n + 5$

(b) Show that if there exists a deterministic polynomial algorithm for the Hamiltonian path, then a deterministic polynomial algorithm can be designed for the Hamiltonian Cycle.

10+10