322552(22)

BE (5th Semester)
Examination Nov.-Dec., 2017
(New Scheme)
Analysis & Design of Algorithms

Time Allowed : 3 hours | *Maximum Marks : 80*
Minimum Pass Marks : 28

Note : (*i*) Part (*a*) of each question is compulsory. Attempt any **two** parts from (*b*), (*c*) and (*d*).
(*ii*) The figures in the right-hand margin indicate marks.

1. (*a*) Find the Big-oh(O) notation for the following functions : [2]

$$f(n) = n^4 + 35n^2 + 84$$

(*b*) State the Master theorem and use the master method to give tight asymptotic bounds for the following recurrences : [7]

(*i*) $T(n) = 4T(n/2) + n$

(*ii*) $T(n) = 7T(n/2) + n^2$

(*c*) Illustrate the performance of the heap-sort algorithm on the following input sequence : [7]

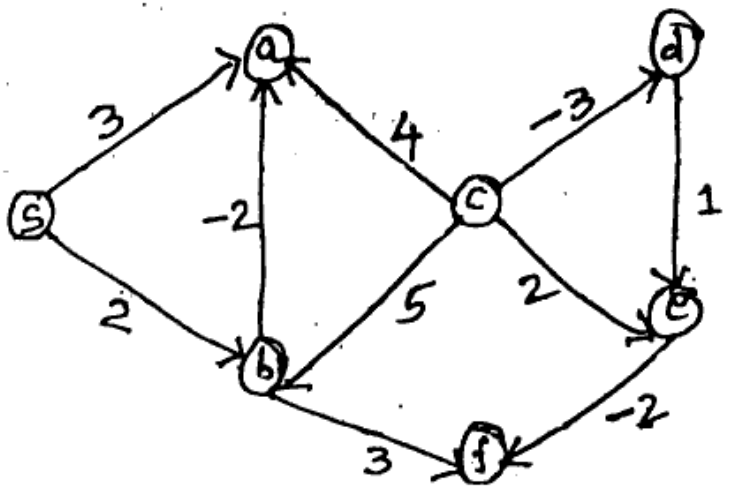
< 2, 5, 16, 4, 10, 23, 39, 18, 26, 15 >

(*d*) What is recurrence equation? Explain the methods for solving the recurrence equation. [7]

2. (*a*) Differentiate between divide-and-conquer algorithm and Greedy method. [2]

(*b*) Consider the Knapsack instance n=3, $(W_1, W_2, W_3) = (2, 3, 4)$ and $(P_1, P_2, P_3) = (2, 3, 5)$, M=5. Find the optimal solution using 0/1 Knapsack and fractional method. [7]

(*c*) Find shortest path using Bellman-Ford algorithm from s to f of the following fig. [7]



(*d*) Write a technical note on optional storage on tapes and optimal merge patterns. [7]

3. (*a*) Define AND/OR graphs. [2]

(*b*) Find an optimal parenthesization of a matrix-chain product whose sequence of dimensions is

< 5, 10, 3, 12, 5, 50, 6 > [7]

(*c*) Write any algorithm to find all-pair shortest path. Derive its complexity. [7]

(*d*) Write short notes on : [7]

(*i*) Travelling salesman problem

(*ii*) Multi-stage graphs

4. (*a*) List out the applications of back tracking. [2]

(*b*) Given a set $S = < 3, 4, 5, 6 >$, and $X=9$, obtain the subset sum using back tracking approach. [7]

(*c*) Design a back tracking algorithm for the Hamiltonian cycle problem. [7]

(*d*) Find all the possible solutions for the 8×8 chessboard, 8 Queens problem. [7]

5. (*a*) Define NP-Hard and NP-Completeness. [2]

(*b*) State and proof Cook's theorem. [7]

(*c*) Solve 15-puzzle problem with the following information : [7]

1	3	4	15
2		5	12
7	6	11	14
8	9	10	13

(*i*) Initial state

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	

(*ii*) Goal state

(*d*) Write a short note on Least cost search and FIFO Branch and Bound Technique. [7]