PMM/KS/15/7090

Faculty of Engineering & Technology

Fifth Semester B.E. (Computer Technology) (C.B.S.) Examination

DESIGN AND ANALYSIS OF ALGORITHM

Time—Three Hours] [Maximum Marks—80

INSTRUCTIONS TO CANDIDATES

(1) All questions carry marks as indicated.

(2) Solve **SIX** questions as follows :

- Que. No. **1 OR** Que. No. **2**
- Que. No. **3 OR** Que. No. **4**
- Que. No. **5 OR** Que. No. **6**
- Que. No. **7 OR** Que. No. **8**
- Que. No. **9 OR** Que. No. **10**
- Que. No. **11 OR** Que. No. **12**

(3) Due credit will be given to neatness and adequate dimensions.

(4) Illustrate the answers with necessary figures/ drawings wherever necessary.

1. (a) Explain the summation of arithmetic and geometric series. 7

(b) Solve the following recurrence relations using Master Theorem :

(i) $T(n) = 9T(n/3) + n$

(ii) $T(n) = 2T(2n/3) + 1$

(iii) $T(n) = 3T(n/4) + n\lg n$ 6

OR

2. (a) Solve the given recurrence relation using Master Method :

$T(n) = 3T(n/4) + \sqrt{n} + 5$ for $n \geq 4$

$T(1) = 2$ 7

(b) Draw recursion force for

$T(n) = T(n/3) + T(2n/3) + O(n)$ and find the upper bound for the recursion. Also comment on value generated using upper bound. 6

3. (a) Explain the Asymptotic notations :

(i) Big O

(ii) Big Omega

(iii) Theta

(iv) Little O

(v) Little Omega. 7

(b) Explain Quick Sort Algorithm with suitable example. Comment on time complexity of Algorithm. 7

OR

4. (a) Implement insertion sort on following array :

18 12 44 64 76 15 129 20

Write recursive algorithm for the same. Comment on stack size required to implement the algorithm. 7

(b) Show the Strassen's matrix multiplication process on the matrix A and B given below :

$$A = \begin{bmatrix} 4 & 2 & 0 & 1 \\ 3 & 1 & 2 & 5 \\ 3 & 2 & 1 & 4 \\ 5 & 2 & 6 & 7 \end{bmatrix}$$

$$B = \begin{bmatrix} 2 & 1 & 3 & 2 \\ 5 & 4 & 2 & 3 \\ 1 & 4 & 0 & 2 \\ 3 & 2 & 4 & 1 \end{bmatrix}$$ 7

5. (a) Illustrate the stepwise operation of Heap Sort on the input array :

$$A = < 5, 13, 2, 25, 7, 17, 20, 8, 3 >$$

Also find the recurrence relation for algorithm and discuss its complexity. 7

(b) Find single source shortest path for the following diagram. Write the algorithm for the same. 6

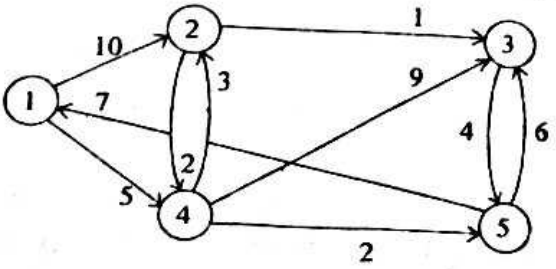

Fig. Q. 5(b)

OR

6. (a) What is minimum spanning tree ? Show the snapshots of Prim's algorithm to find minimum cost spanning tree for the given graph : 7

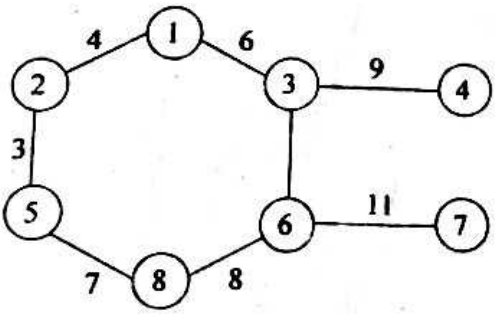

Fig. 6(a)

(b) Explain what is Knapsack problem. Give algorithm for it and time complexity. Solve the following Knapsack problem :

$n = 3 \quad m = 20$

$(P_1, P_2, P_3) = (25, 24, 20)$

$(W_1, W_2, W_3) = (18, 15, 10)$ 6

7. (a) Find the minimum cost path from vertex "s" to "t" in multistage graph shown. Write the algorithm for it. 7

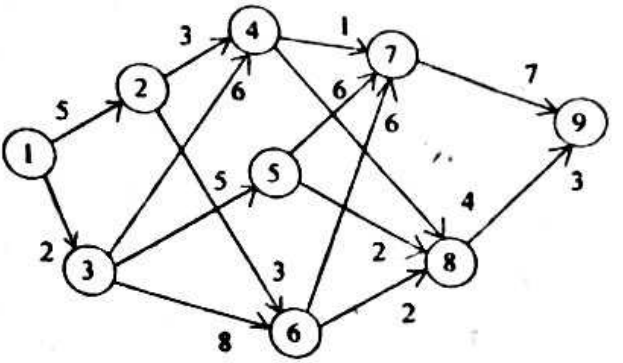

Fig. Q. 7(a)

(b) Find out shortest distance between all pairs of vertices and write the Flyod Washall all pair shortest path algorithm. 7

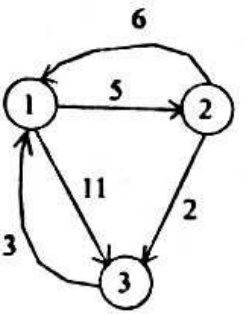

Fig. Q. 7(b)

OR

Paper I

8. (a) Draw Optimal Binary Search Tree for the following. Also generate the matrics required for tree construction.

$n = 5$

i	0	1	2	3	4	5
p_i	—	0.08	0.05	0.12	0.20	0.10
q_i	0.05	0.10	0.05	0.11	0.10	0.04

7

(b) Determine LCS of X = < p, o, l, y, n, o, m, i, a, l > and Y = < e, x, p, o, n, e, n, t, i, a, l > 7

9. (a) Give generalized schema for recursive backtracking algorithm and explain in brief. 6

(b) Explain how backtracking can be applied to solve 4-Queens' problem. 7

OR

10. (a) Explain Graph coloring method with suitable example. Give algorithm for it. 7

(b) Explain Knight's tour problem and give algorithm for it. 6

11. (a) Explain the following NP problems and relation between them :

(i) Clique

(ii) Graph partioned into triangle

(iii) Independent Set Problem (ISP). 8

(b) Write an algorithm for Non-deterministic Sorting. 5

OR

12. (a) Comment on $P \subseteq NP$. 4

(b) Give definition of NP HARD and NP Complete class of problems. 4

(c) How polynomial reduction can be used for showing NP-completeness of a problem ? 5