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मन - 031

Analysis & Design of Algorithms (1110)

P. Pages : 3

Time : Three Hours

Max. Marks : 100

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answersheet should be written with blue ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Attempt **any two** subquestions from each unit.
5. Figure to the right indicate full marks.
6. Assume suitable data if necessary.
7. Use of non-programmable calculator allowed.

UNIT - I

1. a) i) Define algorithm. Why do we study algorithm ? 5
ii) Explain the various specifications that all algorithms must satisfy. 5
b) Write an algorithm for insertion sort & apply on the list
70, 30, 40, 10, 80, 20 60, 50 10
c) Calculate the time complexity for the following : 10
i) $T(n) = T\left(\frac{3n}{4}\right) + 1$
ii) $T(n) = 4T\left(\frac{n}{2}\right) + n$

UNIT - II

2. a) Write an algorithm for binary search & analyze it with example. 10
b) Apply an algorithm of quick sort on the list.
36, 15, 40, 1, 60, 20, 55, 25, 50, 20 10
c) Explain Hiring problem & analyze it. 10

UNIT - III

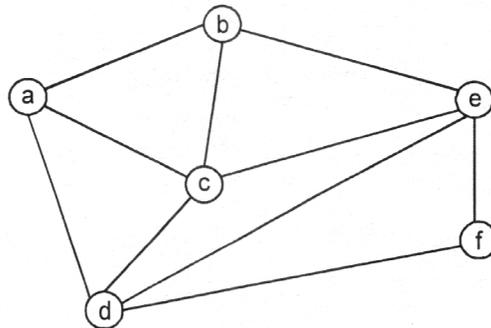
3. a) i) Define backtracking. State an application of it. 5
 ii) Explain lower bound theory for comparison tree sorting and searching. 5

b) Consider the travelling salesman instance which is defined by cost matrix.

$$\begin{bmatrix} \infty & 20 & 30 & 10 & 11 \\ 15 & \infty & 16 & 4 & 2 \\ 3 & 5 & \infty & 2 & 4 \\ 19 & 6 & 18 & \infty & 3 \\ 16 & 4 & 7 & 16 & \infty \end{bmatrix}$$

Obtain the portion of the state space tree that will be generated by LCBB label each node by its value & obtain the reduced cost matrix. 10

- c) Consider a graph $G = (V, E)$ shown in fig. find Hamiltonian cycle using Backtracking method. (assume node a as root) 10



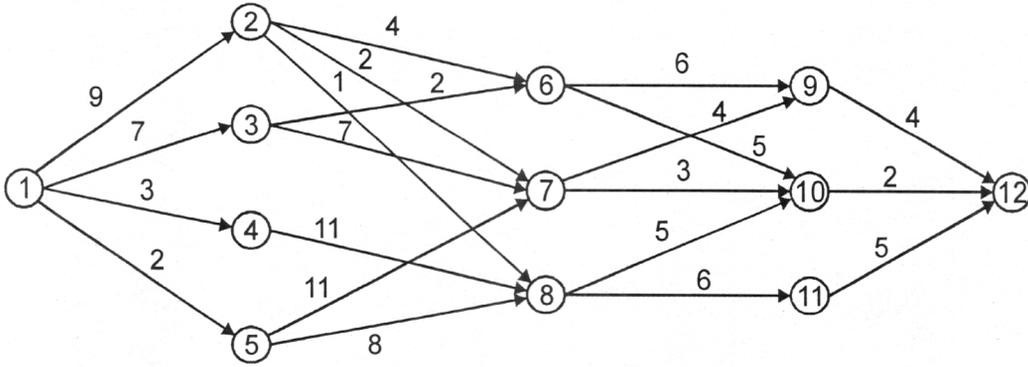
UNIT - IV

4. a) i) What is principle of optimality ? Explain with suitable example. 5
 ii) Consider the knap sack for the instance $n = 4$,
 $(W_1, W_2, W_3, W_4) = (10, 15, 6, 9)$ & $(P_1, P_2, P_3, P_4) = (2, 5, 8, 1)$ & $m = 21$.
 Solve it using dynamic programming approach. 5

b) Obtain the tour for the following graph by the adjacency matrix. 10

$$\begin{bmatrix} 0 & 10 & 15 & 20 \\ 5 & 0 & 9 & 10 \\ 6 & 13 & 0 & 12 \\ 8 & 8 & 9 & 0 \end{bmatrix}$$

- c) Calculate the minimum cost path from source to destination in multistage graph using dynamic strategy. 10



UNIT - V

5. a) i) Explain NP-Hard code generation problem. 5
 ii) Explain decision problem with suitable example. 5
 b) i) Discuss the relationship of P & NP class problem. 5
 ii) Explain Boolean satisfiability problem with suitable example. 5
 c) State & prove cook's theorem. 10
