[Total No. of Questions - 9] [Total No. of Printed Pages - 4]

Dec.-22-0223

CS-506 Analysis & Design of Algorithm (CSE, IT)

B.Tech. 5th (CBCS)

Time : 3 Hours **Max. Marks : 60**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : First question is compulsory. Another have a choice. Attempt all the questions.

1. (a) Write down mathematically definition of Big-Oh notation and Small-Oh notation.

(b) Differentiate between spanning tree and minimum spanning tree.

(c) Write down problem statement for fractional knapsack.

(d) Differentiate between linear search and binary search.

(e) Differentiate between Greedy and Dynamic programming approaches.

(f) Define Cook's theorem.

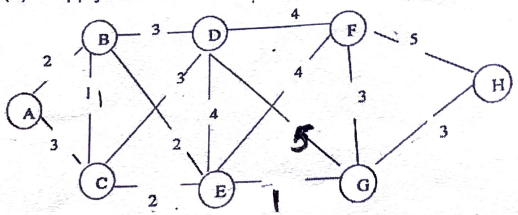
(g) What do you mean by NP-Hard problems?

(h) What is the advantage of Bellman Ford algorithm over Dijkstra's algorithm?

(i) Differentiate between polynomial and non-polynomial time complexity.

(j) Explain adjacency list representation of a tree with an example. (10×2=20)

2. (a) Apply the Kruskal's algorithm on the following graph. (5)



(b) Explain Subset Sum problem with an example. (5)

OR

3. Plan the schedule of eight trains, Train nos. from 1001 to 1008, given in the Table below with their corresponding expected arrival time at destination along with corresponding fine imposed on the railway department if the train arrives late at the destination. All the trains are scheduled from Delhi to Agra and every train takes one and half hour to reach the destination. There is single track for the trains and there is no station between Delhi and Agra. So, any of the trains cannot depart until other train reaches the destination. If the first train starts at 12 am and all the train should reach at Agra by 12 pm. What will be departure time of each train from Delhi to Agra to bear minimum fine on the department.

Train no.	1001	1002	1003	1004	1005	1006	1007	1008
Arrival Time	5 a.m	4 a.m.	2 a.m.	3 a.m.	8 a.m.	7 a.m.	6 a.m.	9 a.m.
Fine	50$	200$	100$	150$	40$	30$	20$	10$

(10)

4. (a) Write down algorithm for binary search and search the element 55 in the following input-

12 13 15 23 25 27 33 66 (5)

(b) Solve the following recurrence relation using master theorem

$T(n) = 4 * T(n/2) + n^3$ (5)

OR

5. Which items to carry in the knapsack to fetch maximum profit having carrying capacity ($m=30kg$) from the given four items (i_1, i_2, i_3 and i_4) whose weights are represented by w_1, w_2, w_3 and w_4 (10kg., 15kg., 6kg., 9kg., respectively) and profits on carrying the item in the knapsack is represented by p_1, p_2, p_3 and p_4 (Rs. 2, Rs. 5, Rs. 8, Rs. 1, respectively). (10)

6. Write short note on any two of the following-

(a) Maximum Bipartite Matching

(b) BIN packing

(c) Sorting Networks (10)

OR

7. Determine the time complexity of following algorithm

For (i = 0; i < n; i + +)

For (j = i + 1; j ≤ n; j + +)

If (A[j] < a[j – 1]) then {

Temp = A[j];

A[j] = A[j – 1],

A[j – 1] = Temp;} (10)

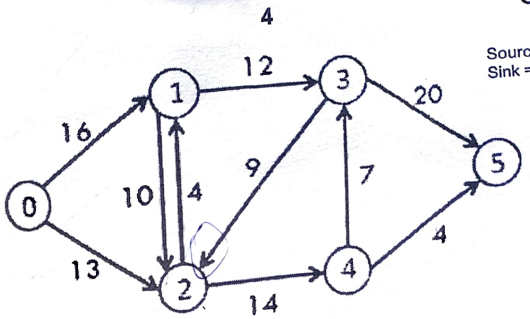
8. Find the maximum flow in the following network while considering the selection of augmented path in the given order-

i) 0-1-2-4-3-5

ii) 0-2-1-3-5

in) 0-1-2-4-5

iv) 0-2-3-2-4-5 (10)



OR

9. Design an optimal binary search tree for the five (n) distinct keys k_1, k_2, k_3, k_4 & k_5 given in sorted order having probabilities of search as 0.05, 0.20, 0.10, 0.05 & 0.20, respectively. Probabilities of searching dummy keys d_0, d_1 d_2, d_3, d_4 & d_5 where d_0 represents all values less than k_1, d_5 represents all values greater than k_5, and the dummy key d_i represents all values between k_i and k_{i+1} for $i = 1, 2, \ldots, n-1$ is 0.05, 0.10, 0.10, 0.05, 0.07 and 0.03. (10)