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The LNM Institute of Information Technology
Design & Analysis of Algorithms (Quiz 2)
(First 6 x 1 + Last 7 x 2 = 20 marks) Time: 40 min

1. Which of the greedy approach results in optimal solution for knapsack problem?
a) Selecting based on profit only
b) Selecting based on weight only
c) Selecting based on profit/weight ratio
d) All of the above

2. What is the time complexity of Interval Partitioning algorithm?
a) O(N)
b) O(NlogN)
c) O(N(logN)^2)
d) O(N^2)

3. If edge weights in a graph is changed by a linear function, then minimum spanning tree in the new graph is different. (True/False?) false

4. loop invariant for B.S. Algo n is
4. MST always contains the edge with minimum weight of a graph. (True/False?)
Precisely lowest ≤ Target ≤ high

5. We are given as input a set of *n* requests (e.g., for the use of an auditorium), with a known start time *si* and finish time *ti* for each request *i*. Assume that all start and finish times are distinct. Two requests *conflict* if they overlap in time. Our goal is to select a maximum-size subset of the given requests that contains no conflicts. Which of the following greedy rules is guaranteed to always compute an optimal solution?
a) At each iteration, pick the remaining request with the earliest start time.
b) At each iteration, pick the remaining request with the fewest number of conflicts with other remaining requests (breaking ties arbitrarily).
c) At each iteration, pick the remaining request with the earliest finish time.
d) At each iteration, pick the remaining request which requires the least time (i.e., has the smallest value of *ti–si*) (breaking ties arbitrarily).

6. Suppose that some of the weights in a connected graph G are negative. For constructing MST which statement is true?
a) Prim's algorithm will work but not Kruskal's
b) Kruskal's algorithm will work but not Prim's
c) None of them will work
d) Both will work (D)

7. Suppose T is a minimum spanning tree of the graph G. Let H be an induced subgraph of G. (I.e., H is obtained from G by taking some subset S⊆Vof vertices, and taking all edges of E that have both endpoints in S.) Which of the following is true about the edges of T that lie in H? You can assume that edge costs are distinct, if you wish.
a) They form a minimum spanning tree of H
b) They might have non-empty intersection with a minimum spanning tree TH of H, but at least one of the edges will be missing from TH
c) They are always contained in some minimum spanning tree of H
d) They might be disjoint from every minimum spanning tree of H

8. Let w be the minimum weight among all edge weights in an undirected connected graph. Let e be a specific edge of weight w. Which of the following is True?
a) There is a minimum spanning tree containing e
b) If e is not in a minimum spanning tree T, then in the cycle formed by adding e to T, all edges have the same weight.
c) Every minimum spanning tree has an edge of weight w

4. loop invariant for B.S Algo^m is Precisely lowest ≤ target ≤ high.

d) All the above

9. A networking company uses a compression technique to encode the message before transmitting over the network. Suppose the message contains the following characters with their frequency:

character	Frequency
a	5
b	9
c	12
d	13
e	16
f	45

If the compression technique used is Huffman Coding, how many bits will be saved in the message w.r.t fixed length coding?

a) 224
b) 800
c) 576
d) 324

a) 80
b) 76
c) 95
D) 115

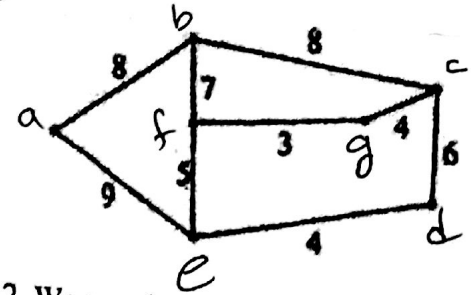
(b) = 76

10. In the above question, which of the following code may represent the word "dead"?

a) 1011111100101
b) 0100000011010
c) Both A and B
d) None of these

11. Refer to the graph below. The minimum cost spanning tree has cost

a) 28
b) 29
c) 30
d) 31



12. We are given 4 sorted files x1,x2,x3,x4 whose size are 20,30,10,5. What is the weighted external path length of the optimal merge tree for the sequence of 2 way merge operation?

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13. For fractional knapsack problem with following data. m=30, (p1, p2, p3, p4) = (25, 24, 10, 15) and (w1, w2, w3, w4) = (12,15, 5, 10) what is the optimal solution vector ?

X[i] = (1, 13/15, 1, 0).