DPP 01

CS & IT

Algorithms

Greedy Method

Q1 Consider the following statements

S_1: The cost of MCST obtained by prim's and kruskals will always be equal.

S_2: A minimum spanning tree can contain negative edges.

Choose the correct statements.

(A) Only S_1 is true

(B) Only S_2 is true

(C) Both S_1 and S_2 are true

(D) neither S_1 nor S_2 is true

Q2 Which of the statement is/are correct?

(A) If there are duplicate weighted edges, the structure of MCST obtained by both prim's and kruskals will always be same

(B) In a graph, if one raises the length of all edge to the power of 3, the minimum spanning tree will stay the same.

(C) The heaviest edge in a graph cannot belong to the minimum spanning tree.

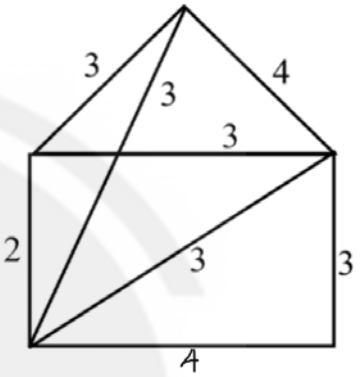
(D) The maximum spanning tree (spanning tree of maximum cost) can be computed by negating the cost of all the edges in the graph and then computing minimum spanning tree.

Q3 Consider the following instantons of the job scheduling problem with deadlines (Note: every Job takes one unit time)

Job	J_1	J_2	J_3	J_4	J_5	J_6	J_7
Deadline	1	3	4	3	2	1	2
Profit	3	5	20	18	1	6	30

What is the maximum profit generated by greedy algorithm _____?

Q4 Consider is the weighted graph G given by



How many MST does G Have?

Q5 Let's suppose, we want to merge some sorted files where the number of records in each file is given below. (15, 18, 20, 21, 24, 28, 30, 32, 35, 40, 45, 50) then what is the minimum number of comparisons required to merge the following files?

(A) 1200 (B) 1225

(C) 1251 (D) 1255

Q6 Greedy algorithm fails to give an optimal solution to which of the following problems?

(p) Travelling salesman problem

(q) merge sort

(r) Binary knapsack problem

(s) optimal merge pattern

(t) Huffman encoding

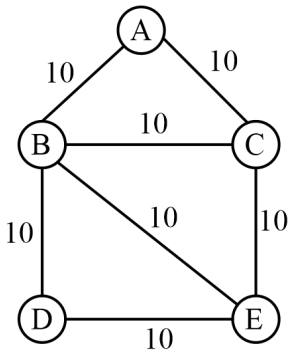
(A) p, q, r

(B) r, s, t

(C) p, q, r, s, t

(D) All of the above

Q7 Consider the following graph G:



How many MST (minimum spanning tree) possible for above graph G? ___

(A) 5 (B) 11

(C) 21 (D) 17

Q8 A message is made up of the characters J, K, L,M and O with the probability given below.

Character	Probability
J	0.20
K	0.32
L	0.38
M	0.04
N	0.06

What is the average length per character by using optimal coding technique ? ____ [upto 2 decimal places]

Q9 Which of the following is/are application of greedy technique?

(A) Bellman ford algorithm

(B) Kruskal algorithm

(C) Longest common subsequence

(D) Sum of subset problem.

Answer Key

Q1	C
Q2	B, D
Q3	74
Q4	4
Q5	C
Q6	A
Q7	C
Q8	2.02
Q9	B

Hints & Solutions

Note: scan the QR code to watch video solution

Q1 Text Solution:

(i) Cost of MST always same whether apply prim's or kruskals.

(ii) Spanning tree can have negative edges its true,

Q2 Text Solution:

False(a): If there are duplicate weight exist in graph then structure may different.

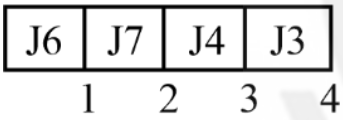
True (b): The MST algorithm care about relative edge lengths and raising all edge lengths, the 3^{rd} power pressure this relationship.

False(c): This edge may be connecting two otherwise dis-connected sub-graphs.

Ture(d): This work, and none of the proofs on MST algorithm depends on edge weight being non-negative.

Q3 Text Solution:

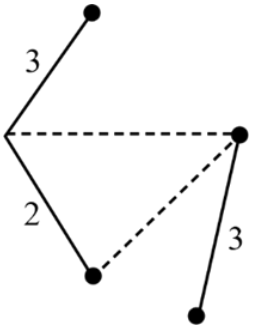
Put earliest deadline schedule with maximum profit first.



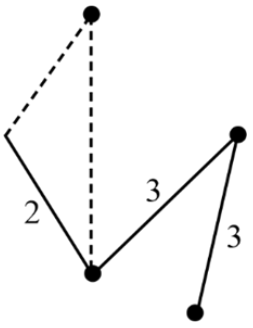
total profit = 6 + 30 + 18 + 20 = 74

74

Q4 Text Solution:



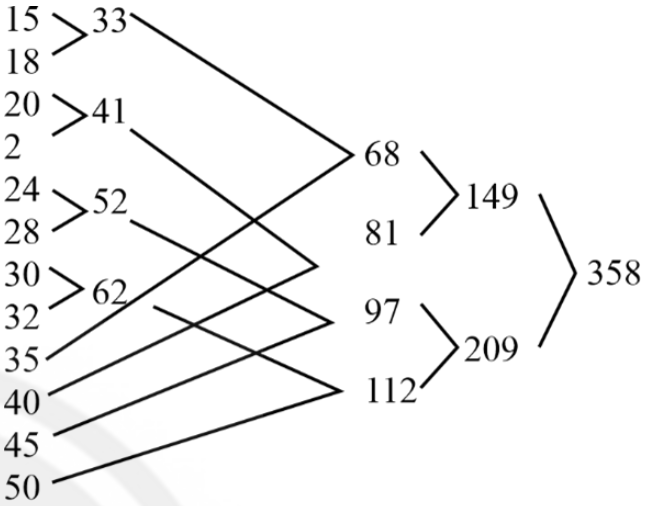
Choose any 1 dotted line here



Choose any one dotted line here

Totals 4 different MST's

Q5 Text Solution:



Total comparisons = m = n – 1

= 32 + 40 + 51 + 61 + 67 + 80 + 96 + 111 + 148 + 208 + 357 =1251

Q6 Text Solution:

Greedy algorithm fails to give an optimal solution for

(p) travelling salesman problem

(q) merge sort

(r) Binary knapsack problem

Q7 Text Solution:

- Weight of every edge is same

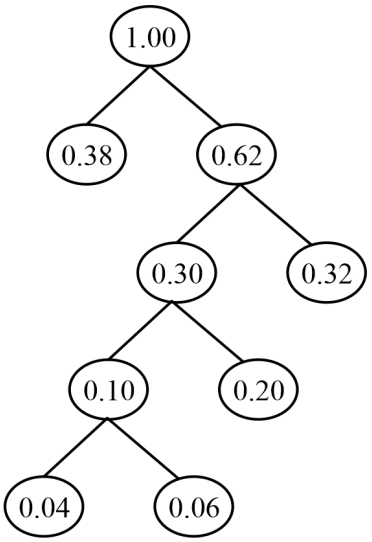
Total MST = Remove both common edges + keep one common edge + keep 2nd common edge + keep both common edge

= 5 + 2 × 3 + 3 × 2 + 2 × 2

= 21

Q8 Text Solution:

Optimal merge pattern:



Average length = 0.10 + 0.30 + 0.62 + 1.00 = 2.02

Q9 Text Solution:

(a) Bellman ford algorithm **False**

(b) Kruskal algorithm **True**

(c) Longest common subsequence **False**

(d) Sum of subset problem. **False**