Branch : CSE/IT Batch : Hinglish

WEEKLY TEST – 04

Subject : Algorithms

Topic : Greedy Method

Maximum Marks 15

Q.1 to 4 Carry ONE Mark Each

[MCQ]

1. Consider the statements

S1: Dijkstra's algorithm for single source shortest path is guaranteed to work if there are no negative cycles.

S2: Prim's algorithm for MST is guaranteed to produce MST even if there is negative weight cycles.

(a) only S1 is true
(b) only S2 is true
(c) Both S1 and S2 are true
(d) Neither S1 nor S2 is true

[MCQ]

2. What is the time complexity of the merge sort algorithm if the array contains more than half of repeated elements?

(a) O(nlogn) (b) O(n)
(c) $O(n^{2)}$ (d) None of these

[MCQ]

3. What is the time complexity of Dijkstra's algorithm in case of a sparse directed connected graph represented as an adjacency matrix.

(a) O(vlogv) (b) O(Elogv)
(c) $O(v^2)$ (d) None of these

[MCQ]

4. What is the time complexity of the job sequencing with deadline algorithm if greedy method is used?

(a) $O(n^2)$ (b) O(nlogn)
(c) O(n) (d) $O(n^2 \log n)$

Q.5 to 8 Carry TWO Mark Each

[MCQ]

5. The profit of the optimal schedule with the following jobs and deadlines given below.

Job	1	2	3	4	5	6
Deadline	5	4	4	2	1	2
Profit	15	12	5	15	13	14

What is the total profit?

(a) 58 (b) 59
(c) 60 (d) 61

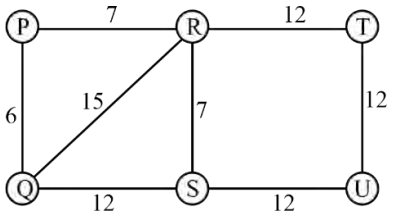
[MCQ]

6. Consider P, Q, R, S which is used to make a text each occurring with the probability of 0.38, 0.25, 0.08, 0.15, 0.14 respectively. Then optimal coding technicians will have the average length of _____.

(a) 2.21 (b) 2.9
(c) 1.58 (d) 1.69

[NAT]

7. Consider the following Graph G.



What is the total number of minimum spanning trees possible using prim's (or) Kruskal's algorithm?

_____

[MCQ]

8. Consider a modified version of Quick sort where we have an input as an sorted array X[1 ……. n], all element of the array is distinct and n ≥ 3. Pivot is median of set of 3 elements (first, middle, last). Then what is the worst-case time complexity of this algorithm?

(a) $O(n^2)$ (b) O(nlogn)

(c) $O(n^2 \log n)$ (d) O(nlog logn)

9. **[NAT]**

Consider the following array with 90 as the first element, all other elements can be in any order.

90, 116, 20, 76, 104, 176, 36

quick sort partition algorithm is used by choosing 1^{st} elements as pivot, then what is the total number of arrangements of integer is possible to preserve the effect of first pass of partition algorithm?

10. **[NAT]**

Consider an array X of length n array contains number between (1 – 10) in any arbitrary order, best sorting algorithm takes 325 ns if n = 25, the time required by algorithm if n = 150 is _____?

Answer Key

1. **(b)**
2. **(a)**
3. **(c)**
4. **(a)**
5. **(d)**
6. **(a)**
7. **(3 to 3)**
8. **(b)**
9. **(36 to 36)**
10. **(1950 to 1950)**

Hints and Solutions

1. (b)

S1(False): if there exist any negative weight edges, then it may or may not work as expected.

S2(True): It is guaranteed to produce the MST even there exists negative weight cycles.

2. (a)

Irrespective of the elements the time complexity of merge sort is always O(nlogn)

3. (c)

If the graph is input by adjacency matrix then the T.C is $O(v^2)$ as for each vertex we need to check if it is connected to all other neighboring vertices.

$\therefore$ option (c) is correct.

4. (a)

for Job sequencing algorithm, time required to sort in order get maximum profit is O(nlogn) find the max deadline = O(n)

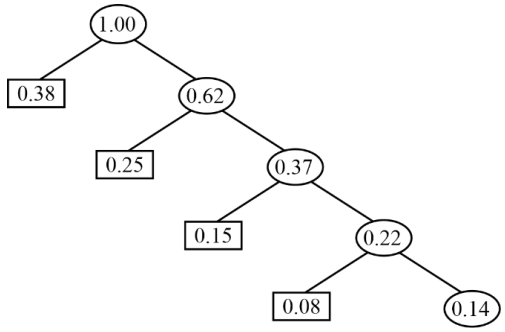
For each slot 'i' apply linear search to find a job containing deadline $\geq$ i = O (n^2)

$T(n) = O(n\log n) + O(n) + O(n^2) = O(n^2)$

5. (d)

Time	1	2	3	4	5	
Job	J6	J4	J3	J2	J1	Total profit
Profit	14	15	5	12	15	61

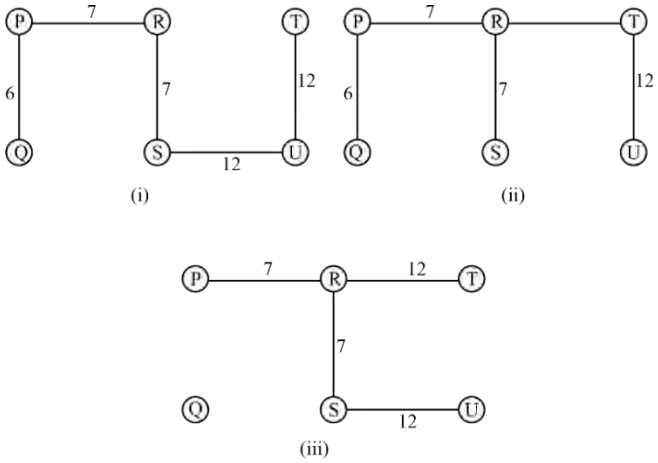
6. (a)



Average length = 0.38 × 1 + 0.25 × 2 + 0.15 × 3 + 0.08 × 4 + 0.14 × 4

= 0.38 + 0.5 + 0.45 + 0.32 + 0.56 = 2.21

7. (3 to 3)



8. (b)

As we can see that array is sorted, finding first, middle and last will take O(1) time and the selected pivot will divide the given array in two pards of n/2.

$$T(n) = 2T\left(\frac{n}{2}\right) + O(n)$$

= O (nlogn)

9. (36 to 36)

First element is chosen as pivot and 90 is first elements, after 1St pass pivot goes to correct place.

So, all elements less than 90 go to left of it and greater will go to right of pivot.

20 36 76 90 116 104 176

3! 3!

6 × 6 = 36

10. (1950 to 1950)

We known the range of the elements present in the array X, so we can use counting sort, which takes O(n) time

C.n = 325

C.25 = 325

C = 13

n = 150

150 × 13 = 1950

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