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CSE - B II
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DAA

ASSIGNMENT - 2

1) Problem conference Session management using greedy approach

Session	Start time	end time
1	1	3
2	2	4
3	3	5
4	6	7
5	5	8

Ans:-

i) Sort by end time.

- Iterate through each session check
- if start time operates equal to end time.
- If it is then select the session

  i) Add to selected session

  ii) Update and time to selected session and time.

i) Let end time = 0

	start 1 > 0	1
		End time = 3
2	start 2 < 3	1
3	start 3 = 3	End time = 3
4	start 6 > 5	1,3 end time = 5
5	start 5 < 3	1, 3, 5

The selected session are 1, 3, 5.

Thus the maximum or non over lapping Session is 3.

2)

Items	Weight	Value
1	10	60
2	20	100
3	30	120

Ans: Sort the weight in descending order

Now,

the weight becomes

30	20	10
120	100	60

Take the Value 1 by 1

First 30 : check $30 \leq 50$

if true

then sum = sum + Value

Then decrement current i from total

Now, $50 - 30 = 20$

Total Weight

Now, $20 \leq 20$ true

sum = 220

Next, ~~30~~ $- 20 = 0$

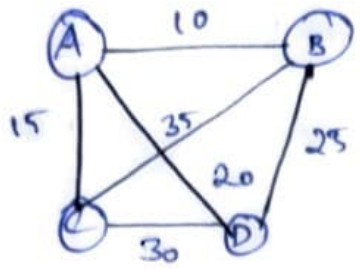
$10 \leq 10$. False → exits

So, the total Value can be stored is 220 With items 2, 3.

3)

City	A	B
A	0	10
B	10	0
C	15	35
D	20	25

Let us design an road map for this



1) start a city A

2) Visit the nearest unvisited city from current city.

3) Repeat step 2 until all cities have been Visited.

4) After visiting all cities, return to the starting city.

Start with A

From A:

A → B : 10

A → C : 15

A → D = 20

∴ B is short

4)

Character	Frequency
A	5
B	9
C	12
D	13
E	16
F	45

Ans:-

Step-1 :- create leaf node for each Character and their corresponding frequency

A (5), B(9), C(12), D(13), E(16), F(45).

Step-2 :-

Build by taking any two lowest nodes i.e (A=5 and B=9) merge them create AB as 14.

Next, new nodes

(C = 12) (D = 13) (E = 16)

(F = 45) (AB = 14)

From B

B → A : 10 (Already visited)

B → C : 35

B → D : 25

∴ D is shortest

From D

D → C : 30

∴ C is shortest

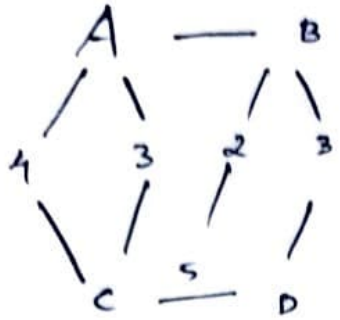
From C

C → A : 15

∴ Route :-

- A → B → D → C → A
- Total distance = 80

5)



Ans Sort all edges in increasing order of their weights

Pick the smallest edge: if it doesn't form a cycle add it to the MST.

Repeat step 2 until you have added (V-1) edges (where V is the number of Vertices).

steps:- A → B : 1 MST {A-B}

B → D : 2 MST {A-B, B-D}

A → D : 3 forms cycle skip

A → C : 4

{A-B, B-D, A-C}

>>> Total weight of the MST : 1+2+4 = 7

- From above the lowest frequency are (C = 12 and D = 13.) merge them
- Create a node with frequency of 25

→ New nodes (E = 16) (F = 45) (AB = 14) (CDE 25)

Take E and E and Combine

New nodes (AB = 14) (CDE = 25) (EF =

- Take (AB and E)

→ (F = 45) (CD = 25) (ABE = 30)

- Take (CD and ABE) merge them

→ New nodes (F = 45) (ABECD = 55)

Merge last two

The root node is 100

>>> Resulting Huffman codes:-

A	11 00	D	1 0
B	11 01	E	01
C	1 1 1	F	0

6)

i) $T(n) = 5T(n-1) + n^3$

Forward Substitution

$T(n) = 5T(n-1) + n^3$

$T(n-1) = 5T(n-2) + (n-1)^3$

$T(n-2) = 5T(n-3) + (n-2)^3$

After substituting back into the original recurrence:

$T(n) = 5[5T(n-2) + (n-1)^3] + n^3$

Substituting again:

$T(n) = 5^2 T(n-3) + 5^2 (n-2)^3 + \dots$

Backward Substitution:

For backward substitution we start by expressing the recurrence backwards to look for a general form. The key is to express each subsequent term using the prior term.

iii) $T(n) = 4T\left(\frac{n}{2}\right) + n^2$

Forward Substitution

$T(n) = 4T\left(\frac{n}{2}\right) + n^2$

$T\left(\frac{n}{2}\right) = 4T\left(\frac{n}{4}\right) + \left(\frac{n}{2}\right)^2$

Sub $T(n/2)$ into $T(n)$

$T(n) = 4\left(4T\left(n/4\right) + \left(\frac{n}{2}\right)^2\right] + n^2$

$= 4^2 T$

7) i) $a = 3 \quad b = 2 \quad k = 1 \quad p = 1$

a	b^k
3	2^1

$3 > 2$

$T(n) = O(\log_2 3)$

ii) $T(n) = 4T(n/2) + n^2$

$a = 4 \quad b = 2 \quad d = 2$

a	b^d
4	2^2
4	4

$a = b^d$

$T(n) \in n^2 \log n$ //