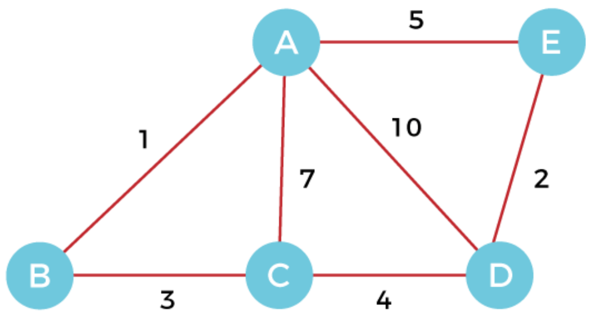
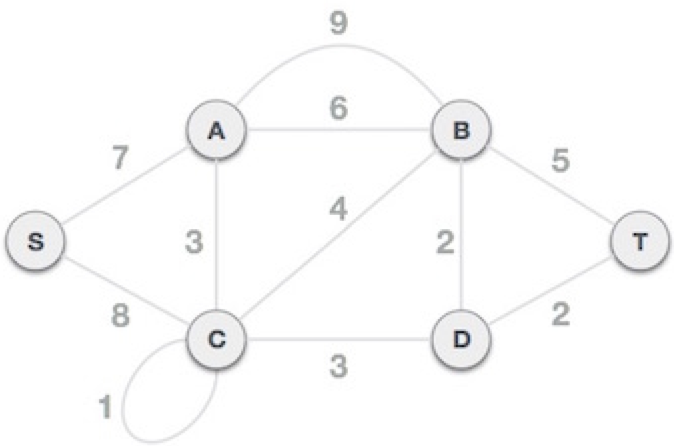
USN

CMRIT
CMR INSTITUTE OF TECHNOLOGY, BENGALURU.
ACCREDITED WITH A++ GRADE BY NAAC

Internal Assessment Test 2 – AUG 2023

Sub:	**Design & Analysis of Algorithms**			Sub Code:	21CS42	Branch:	**ISE**
Date:	**09/08/2023**	Duration:	**90 min**	Max Marks: **50**	Sem/Sec:	**IV / A, B & C**	**OBE**

	Answer any FIVE FULL Questions	MARKS	CO	RBT
1(a)	Apply Kruskal's algorithm in the following graph and find out the minimum cost spanning tree. Consider A as the source/starting vertex. 	[06]	CO3	L3
(b)	How to detect cycle when a new edge is added according to Kruskal's algorithm? Explain with a recursive code.	[04]	CO3	L3
2	Apply Prim's algorithm in the following graph and find the minimum spanning tree. Consider S as the source/starting vertex. .(Hint: remove self loop and parallel edge first) 	[10]	CO3	L3
3	a. For the given set of items and the knapsack capacity of 10 kg, find the subset of the items to be added in the knapsack such that the profit is maximum. b. Explain the time complexity of your strategy.	[7 + 3= 10]	CO3	L3

items	1	2	3	4	5
Weights (in kg)	3	3	2	5	1
Profits	10	15	10	12	8

4	Apply Dijkstra’s Algorithm in the following directed graphs (Given adjacency matrix) and discuss the result with proper justification.	[5+5=10]	CO3	L3

a)

	A	B	C	D
A	0	1	0	0
B	0	0	3	0
C	0	0	0	3
D	0	-4	0	0

b)

	A	B	C	D
A	0	1	0	0
B	0	0	2	0
C	0	0	0	3
D	0	-6	0	0

5.	Discuss the best case and worst case time complexity of Quick Sort algorithm. Give proper mathematical justification.	[5+5=10]	CO2	L3
6.	a) Consider the following tasks with their deadlines and profits. Schedule the tasks in such a way that they produce maximum profit after being executed. b) Write down a pseudo code to provide a generalized solution	[6+4=10]	CO3	L3

S. No.	1	2	3	4	5
Jobs	J1	J2	J3	J4	J5
Deadlines	2	2	1	3	4
Profits	20	60	40	100	80

7.	Design an efficient algorithm for the following problem.	[10]	CO3	L3

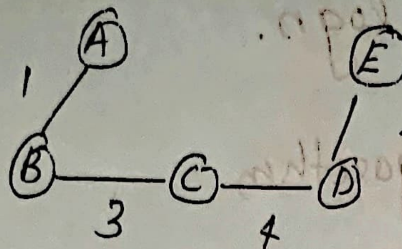
You are a poor person in an island. There is only one shop in this island; this shop is open on all days of the week except for Sunday. Consider following constraints:

- N – Maximum unit of food you can buy each day.
- S – Number of days you are required to survive.
- M – Unit of food required each day to survive.

		Find the minimum number of days on which you need to buy food from the shop so that you can survive the next S days, or determine that it isn't possible to survive. Example: Input : S = 10, N = 16, M = 2 Output : Yes I can survive if I buy food for 2 days.			

Faculty Signature CCI Signature HOD Signature

1. a)

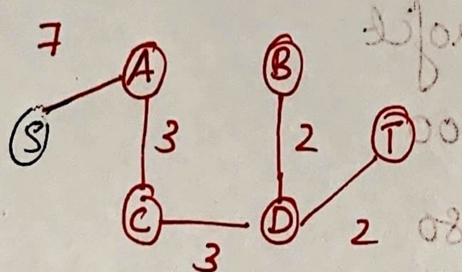


minimum spanning tree cost = 1+3+4+2

= 10 units

1. b) using find_set(vertex)

2)



minimum spanning tree cost = 7+3+3+2+2

= 17 units

3. a)

item	weight	Profit	Pi/wi
1	3	10	3.3
2	3	15	5
3	2	10	5
4	5	12	2.4
5	1	8	8

Profit = 8+15+10+10+12×1/5

= 45.4 units

items added = $I_5, I_2, I_3, I_1, \frac{1}{5} I_4$

3. b). Time Complexity = $n \log n$.

4. a) can apply Dijkstra's Algorithm

b) cannot apply " "

5. <u>Quick Sort</u>

Worst case Time Complexity = $O(n^2)$

Best case Time Complexity = $O(n \log n)$

6. a)

Jobs	Deadline	Profit
J_4	3	100
J_5	4	80
J_2	2	60
J_3	1	40
J_1	2	20

J_3	J_2	J_4	J_5

0 1 2 3 4

Maximum profit = 100+80+60+40

= **280 units**

6 b) Algorithm for job scheduling in pseudo code.

Sol :

- If M > N
- then the person cant survive. } ans : No

- If N x 6 < M x 7
- then cant survive } ans : No

Code :

```
def survival(S, N, M):
    if(((N*6) < (M*7)
        and
        S>6) or M<N):

        print("NO")

    else:
        days = (M*S)/N
        if ((M*S)%N != 0):
            days = days+1
```

Experiment No.

Page No.:

print ("yes"),

print (days).

S = 10; N = 16; N = 2

Survival (S, N, M).