

NAME # ZAIN UL ABIDEEN

ID # 14713

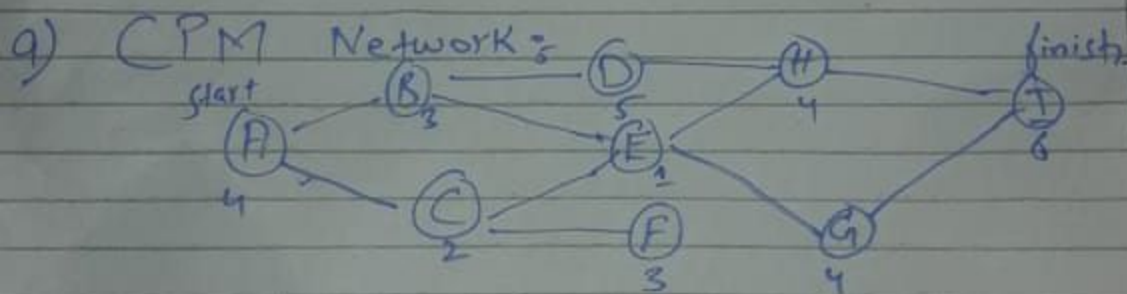
SECTION # B

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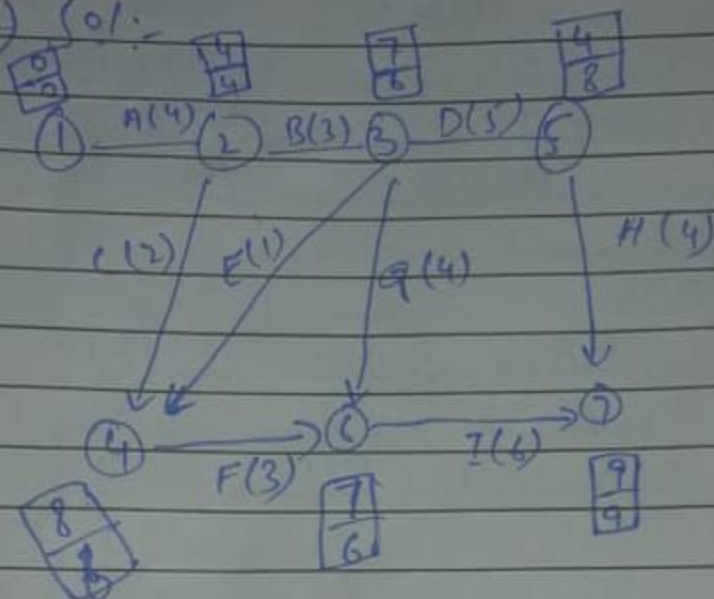
Name Zain-ul-Abideen
 B.S soft engineering
 Section B
 I.D 14713

Q1:-

| Activity | Predecessor | time |
|----------|-------------|------|
| A | - | 4 |
| B | A | 3 |
| C | A | 2 |
| D | B | 5 |
| E | B, C | 1 |
| F | C | 3 |
| G | E, F | 4 |
| H | D, E | 4 |
| I | H, G | 6 |



Q1 b) Sol:-



$$\text{Node 1} = 0$$

$$\text{Node 2} = 0 + 4 = 4$$

$$\text{Node 3} = 4 + 3 = 7$$

$$\text{Node 4} = 3 + 1 = 4$$

$$\text{Node 5} = 3 + 5 = 8$$

$$\text{Node 6} = 3 + 4 = 7$$

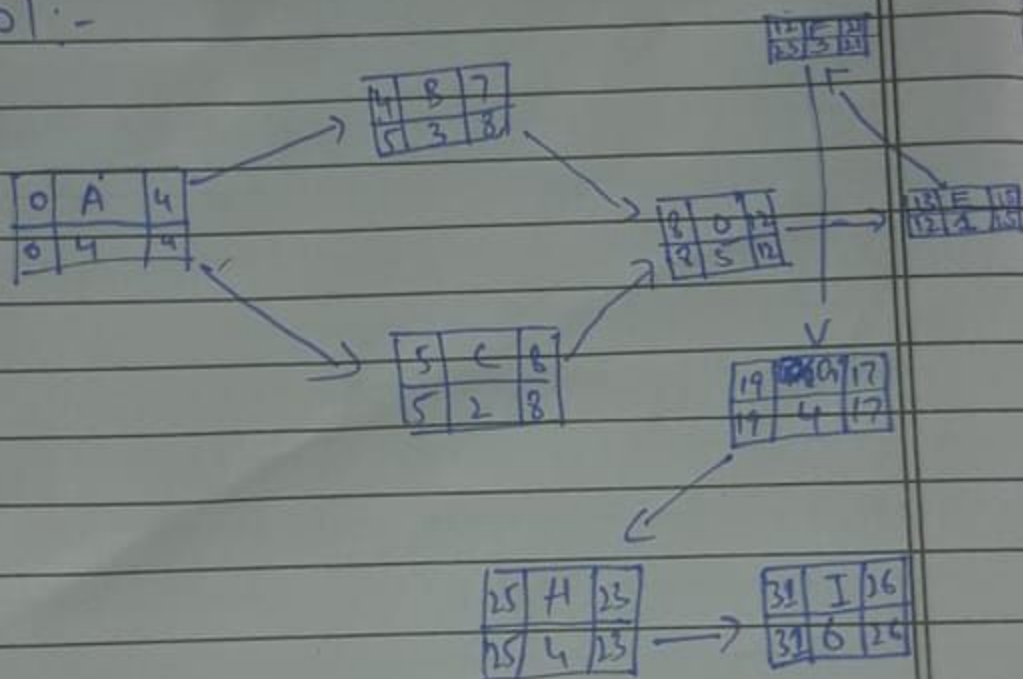
$$\text{Node 7} = 5 + 4 = 9$$

Q1 (C)

$$TF = LF - EF$$

$$TF = L_s - E_s$$

Sol:-

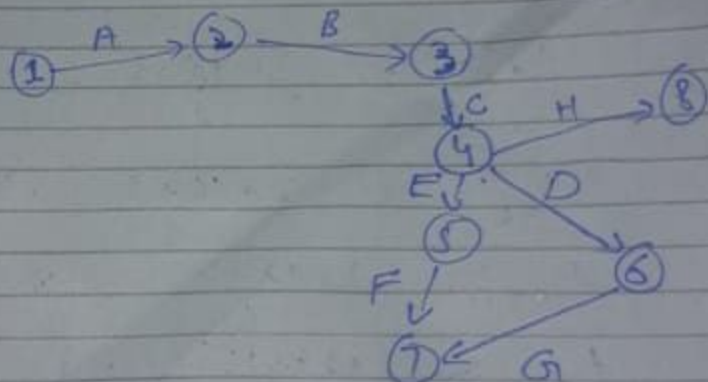


Q2

| Activity | Predessor | optimistic time | Most likely time | Pessimistic time |
|----------|-----------|-----------------|------------------|------------------|
| A | - | 4 | 5 | 12 |
| B | A | 2 | 3 | 4 |
| C | B | 6 | 8 | 22 |
| D | C | 4 | 6 | 8 |
| E | C | 3 | 4 | 5 |
| F | E | 2 | 4 | 6 |
| G | D, F | 2 | 3 | 4 |
| H | C | 5 | 7 | 15 |

Solution

a)



b) Using

| Activity | Predessor | O | M | P | Most expected duration | Variance |
|----------|-----------|---|---|----|------------------------|----------|
| A | - | 4 | 5 | 12 | 6 | 1.77 |
| B | A | 2 | 3 | 4 | 3 | 0.11 |
| C | B | 6 | 8 | 22 | 10 | 7.09 |
| D | C | 4 | 6 | 8 | 6 | 0.44 |
| E | C | 3 | 4 | 5 | 4 | 0.11 |
| F | E | 2 | 4 | 6 | 4 | 0.44 |
| G | D, F | 2 | 3 | 4 | 3 | 0.11 |
| H | C | 5 | 7 | 15 | 8 | 2.76 |

by formula

$$t_{e1} = \frac{L_0 + 4t_m + t_p}{6}$$

$$= \frac{4 + 20 + 12}{6} = 6$$

$$t_{e2} = \frac{2 + 12 + 4}{6} = 3$$

$$t_{e3} = \frac{6 + 32 + 22}{6} = 10$$

$$t_{e4} = \frac{4 + 24 + 8}{6} = 6$$

$$t_{e5} = \frac{3 + 16 + 5}{6} = 4$$

$$t_{e6} = \frac{2 + 16 + 6}{6} = 4$$

$$t_{e7} = \frac{2 + 12 + 4}{6} = 3$$

$$t_{e8} = \frac{5 + 28 + 15}{6} = 8$$

Variance (σ^2)

$$\sigma^2 = \left(\frac{t_p - t_0}{6} \right)^2$$

$$\sigma_1^2 = \left(\frac{12 - 4}{6} \right)^2 = \left(\frac{8}{6} \right)^2 = 1.77$$

$$\sigma_2^2 = \left(\frac{4 - 2}{6} \right)^2 = \left(\frac{2}{6} \right)^2 = 0.11$$

$$\sigma_3^2 = \left(\frac{22 - 6}{6} \right)^2 = \left(\frac{16}{6} \right)^2 = 7.09$$

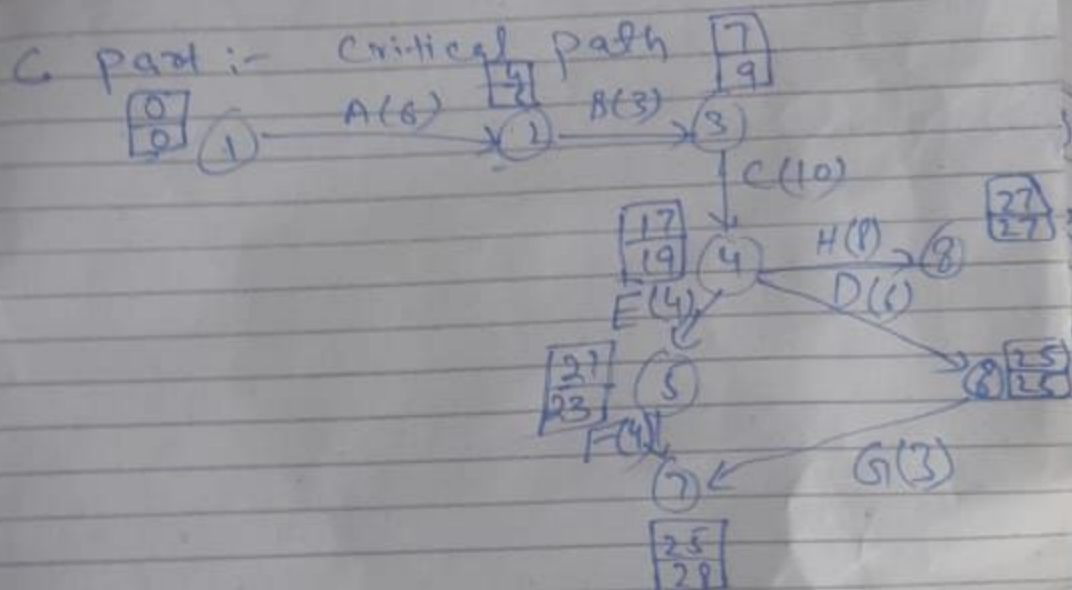
$$\sigma_4^2 = \left(\frac{8 - 4}{6} \right)^2 = \left(\frac{4}{6} \right)^2 = 0.44$$

$$\sigma_5^2 = \left(\frac{5-3}{6}\right)^2 = \left(\frac{2}{6}\right)^2 = 0.11$$

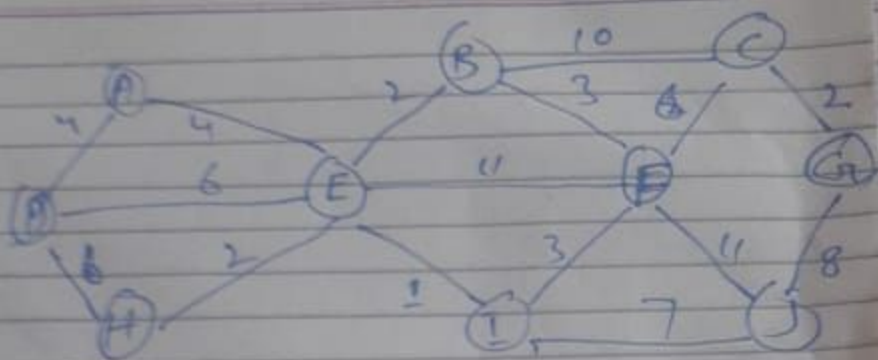
$$\sigma_6^2 = \left(\frac{6-2}{6}\right)^2 = \left(\frac{4}{6}\right)^2 = 0.44$$

$$\sigma_7^2 = \left(\frac{4-2}{6}\right)^2 = \left(\frac{2}{6}\right)^2 = 0.11$$

$$\sigma_8^2 = \left(\frac{15-5}{6}\right)^2 = \left(\frac{10}{6}\right)^2 = 2.76$$



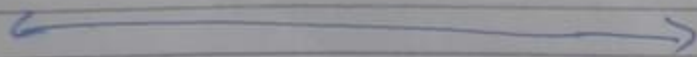
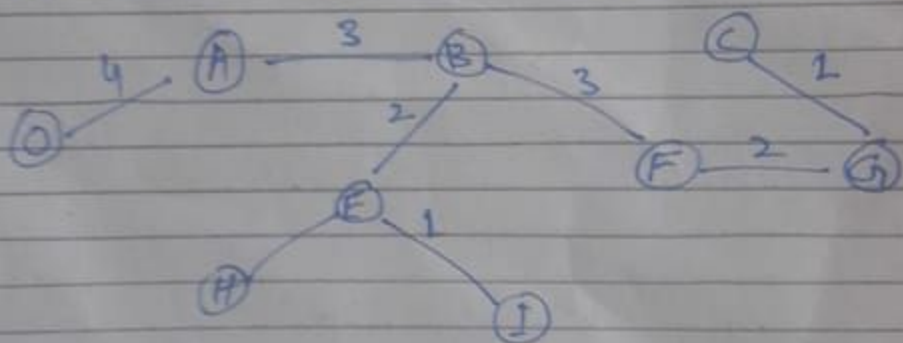
Q 3 :-



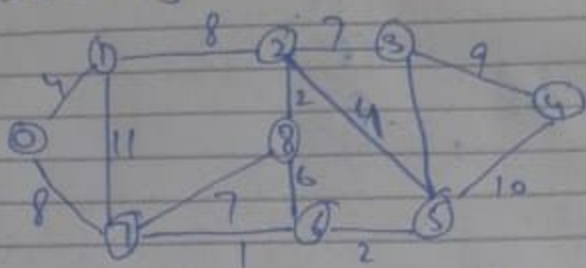
ANS:- In above diagram we connected all vertices on minimum spanning tree looks like

It is list of edges.

$(C-G, G-F, F-B, B-E, I), E-H, B-A, A-D)$



Q4:- Find minimum spanning tree using Kruskal's algorithm.



Sol:- The graph contains 9 vertices and 14 edges so the minimum spanning tree formed $(9-1) = 8$ edges.

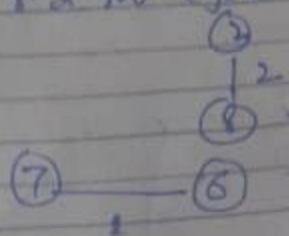
After sorting

| Weight | src | Dest |
|--------------|-----|------|
| 1 | 7 | 6 |
| 2 | 8 | 2 |
| 2 | 6 | 5 |
| 4 | 0 | 1 |
| 4 | 2 | 5 |
| 6 | 8 | 6 |
| 7 | 2 | 3 |
| 7 | 7 | 8 |
| 8 | 0 | 7 |
| 8 | 1 | 2 |
| 9 | 3 | 4 |
| 10 | 5 | 4 |
| 11 | 1 | 7 |
| 14 | 3 | 5 |

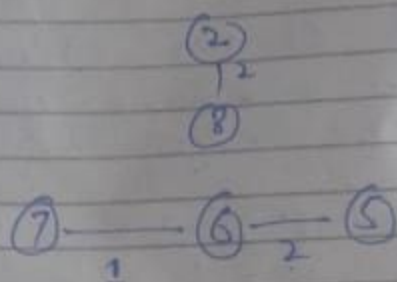
Pick edge 7-6. No cycle form include it.



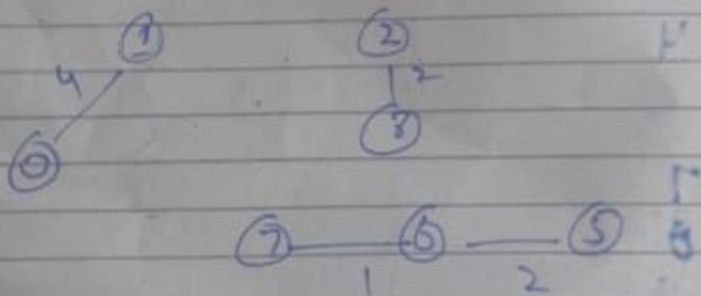
2) Pick edge 8-2 no cycle form include it



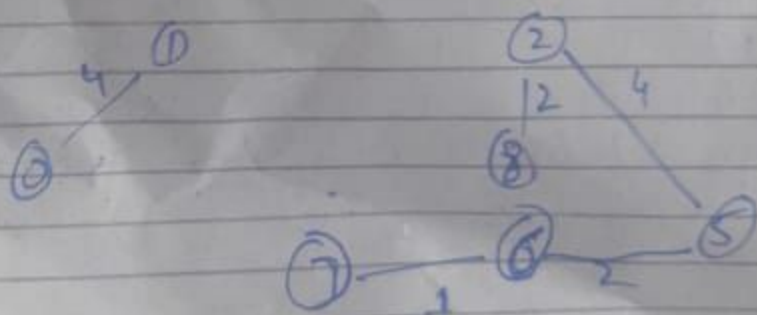
3)



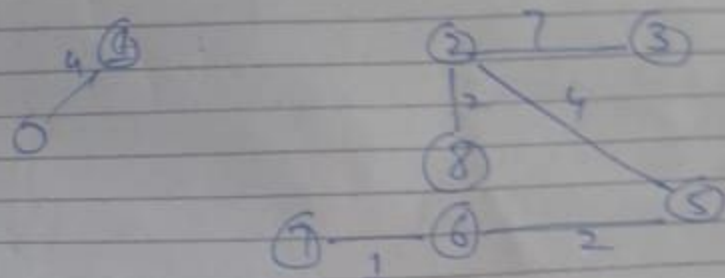
4)



5)

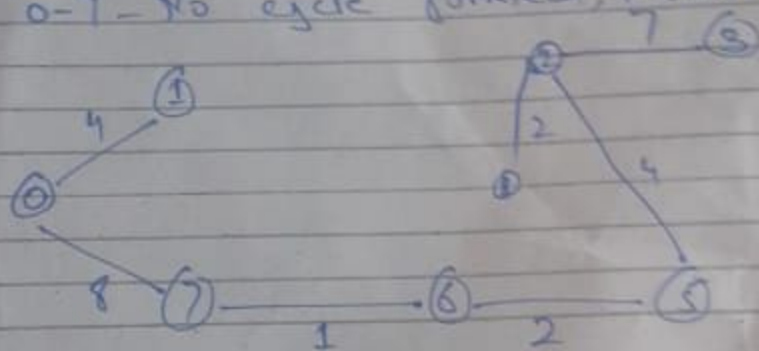


- 6) Pick edge 8-6. this include cycle so discard
 7)



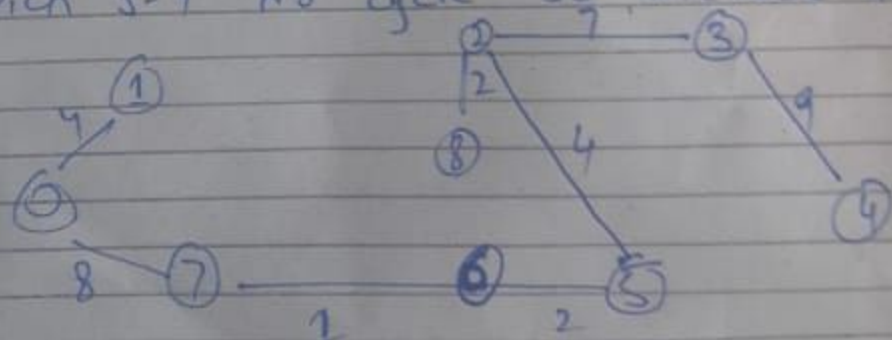
- 8) Pick 7-8 - since include cycle so discard it.

- 9) Pick 0-7 - No cycle formed, include it



- 10) Pick 1-2 formed cycle so discard it

- 11) Pick 3-4 No cycle so include it



Since number of edges included equals $(V-1)$ the algorithm stops here.

Q5:- Write detailed note on how operation research will help in Professional life?

Ans:- Computer Science and operations research are interrelated since their origin each contributing the dramatic advances of each other. The main idea of operation research-based modeling in computer science applications is the systematic approach of ~~the~~ to deal with the problem and get the optimized solution.

This is one of the best platform where we get the best knowledge with the profit and loss concept. This concept is used to find the minimum cost and expected time to finish project. Operation research also represents a clear idea about co-operation between intelligent relations with decision making. The optimization models are very useful in computer science especially in software engineering and computer network domains.

A system model can be built and mathematically prove by O.R Models. The main overview of operation research is to give the perfect solution to win a war without fighting it.

The implementation of O.R is mainly depended on the person who provides the solution and person who use the solution.

It is also useful in general management.

The mathematical techniques used in operation research helps managers to do their job more effectively.

Maintaining Better Control:-

Manager use techniques of operation research to maintain better control over their subordinates. This is possible bcoz operations research provide a basis in which to establish standards of

performance and ways to measure productivity. ^{coordination of departments} Better ~~decision making~~ ^{Operation research} analysis blend together the objectives of different departments.

Better decision making:- The mathematical models of operations research allow people to analyze a greater number of alternatives and constraints than would usually be possible, if they were to use only an intuitive approach.

You become better strategist. The O.R discipline looking at problems, creating models and setting up analysis that points to better options and results helps you make you better personal and professional decisions.

You can make great living:- Average salary for O.R professional is \$ 60,000 to 70,000 dollars that make his life great.

you have opportunity to solve real world problems.
In areas like health care, public policy,
resource management and disaster relief,
you can truly change people's lives
for better.