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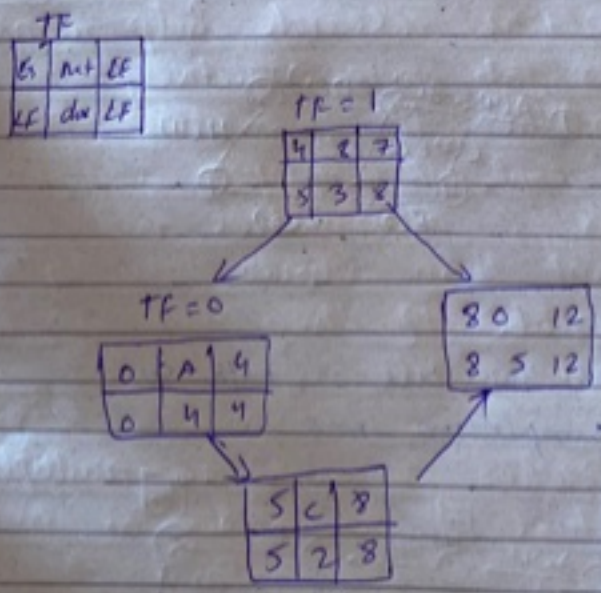
Q5=

Ans=

For Node 1 = ES1 = 0
Node 2 = 0+4 = 4
Node 3 = 4+3 = 7
Node 4 = 3+1 = 4
Node 5 = 3+5 = 8
Node 6 = 3+4 = 7
Node 7 = 5+4 = 9

Completion time =
0+4+7+4+8+7+9 = 39

(c) Total float = TF
TF = LF - EF Finish float
TF = L1 - E1 start float



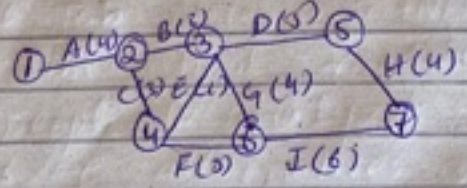
Question # 1

Q1: The given table shows the details of a projects:

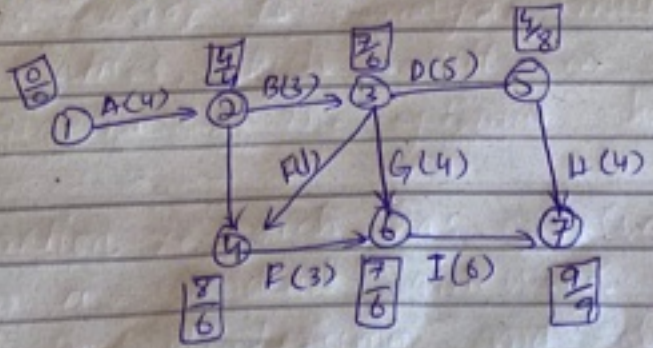
Activity	Predecessor	Time
A	-	4
B	A	3
C	A	2
D	B	5
E	B, C	1
F	C	3
G	E, F	4
H	D, E	4
I	H, G	6

Answer:-

(a) Calculate the CPM network.



(b) Determine the critical path & project completion time.



We Knows that

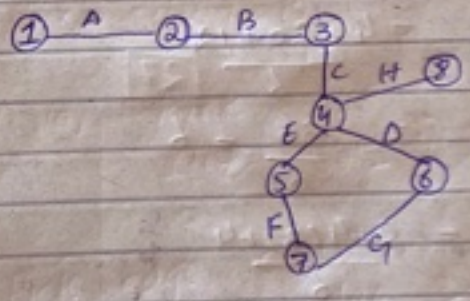
$$Esj = Max(ESi + Dij)$$

Question # 2

The given table shows the details of a project:

Activity	Predecessor	optimistic time	M	P
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

(a) Construct the project network.



(b) Find the expected duration & variance for each activity.

Activity	Predecessor	o	M	P	expected duration	Varriance
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

mean $te_1 = \frac{t_o + 4t_m + t_p}{6}$

$= \frac{4 + 4(5) + 12}{6}$

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

$= \frac{36}{6} = 6$

$te_2 = \frac{2 + 4(3) + 4}{6}$

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

$te_3 = \frac{6 + 4(8) + 22}{6}$

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

$te_4 = \frac{4 + 4(6) + 8}{6}$

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

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

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

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

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

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

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

$t_{e8} = \frac{5+4(7)+15}{6}$

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

Variance (σ^2) :-

$\sigma^2 = \frac{(t_p - t_e)^2}{6}$

$\sigma_1^2 = \frac{(12-4)^2}{6} = \left(\frac{8}{6}\right)^2 = (1.33)^2 = 1.77$

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

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

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

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

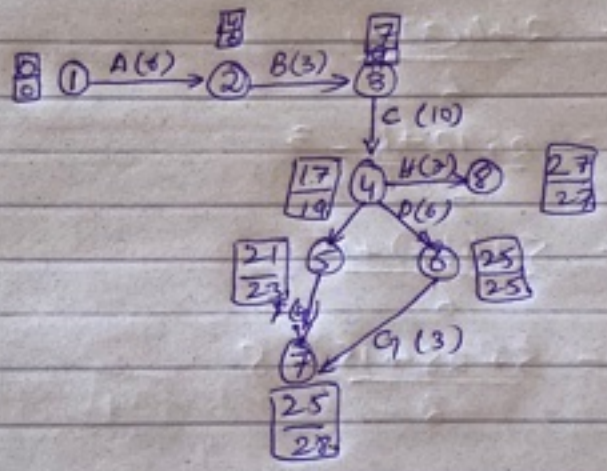
$\sigma_6^2 = \frac{(6-2)^2}{6} = \left(\frac{4}{6}\right)^2 = 0.44$

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

$$S_8^2 = \frac{(15-5)^2}{6} = \left(\frac{10}{6}\right)^2 = 2.76$$

(c) Find the critical path & expected project, completion time.

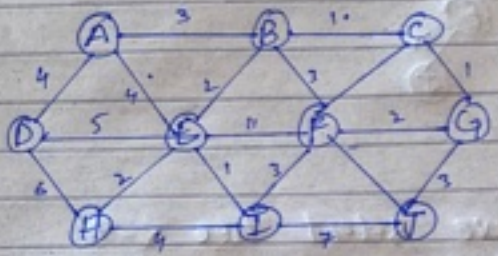
Critical path :-



Completion time = 27

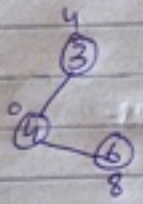
Question # 3

For the following graph, find the minimum spanning tree using prim algoritham. start with vertices A.

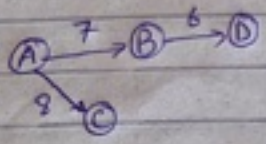


Answer =

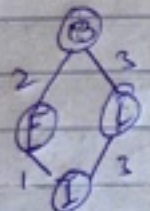
Prims algoritham to find minimum cost spanning treats the node as a single tree and keep an adding new nodes to the spanning tree



Pick the vertics with minimum key value and not already included vertix -

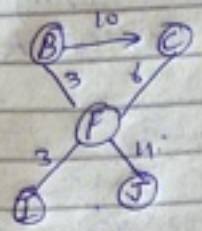


Remove all loops vertix edges from the given graph

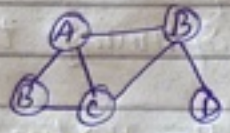


6 In this case we chose B node

as the root of prime's spanning tree.



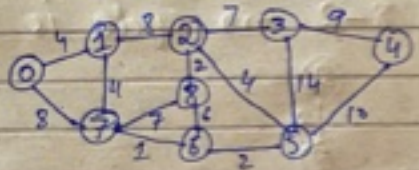
Now we select tree S-T is treated as one node & we check for all edges going out from it we select the one which has the lowest cost & include it in the tree.



we choose the edges.

Question # 4

For the following graph, find the minimum spanning tree using Kruskal's algoritham?



Answer:-

The graph contains 9 vertices and 14 edges the minimum spanning tree formed will be having (9-1) = 8 edges.

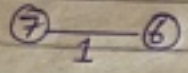
→ After sorting:-

weight	Src	Dest
1	7	6
2	8	2
3	6	5
4	0	1
5	2	5
6	8	6
7	2	3
8	7	8
9	0	7
10	1	7
11	3	4
12	5	4
13	3	7
14	1	5

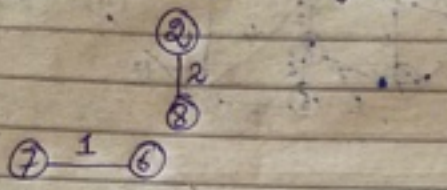
In this case we

→ Now pick all edges one by one.

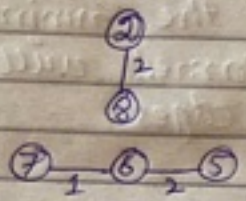
(1) Pick edge 7-6 No cycle is formed



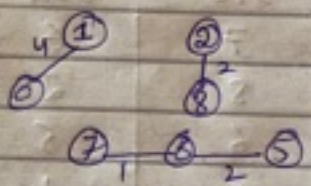
(2) Pick edge 8-2 no cycle is formed



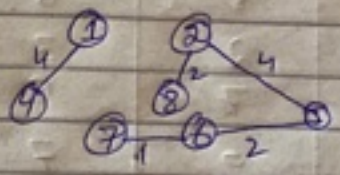
(3) Pick edge 6-5 no cycle is formed



(4) Pick edge 0-1 no cycle is formed

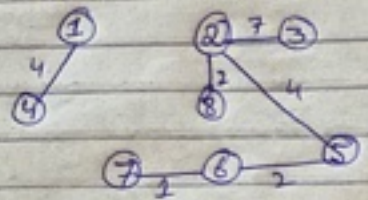


(5) Pick edge 2-5 no cycle is formed



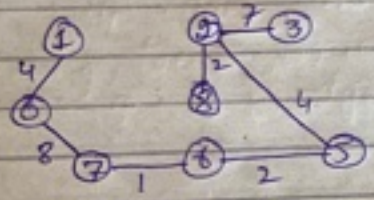
(6) Pick edge 3-6 since including this edge result is cycle.

(7) Pick edge 2-3 no cycle is formed.



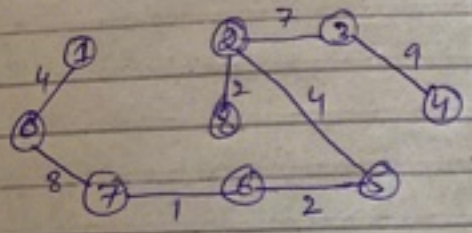
(8) Pick edges 7-8 since including this edge result in cycle.

(9) Pick edge 0-7 no cycle is formed.



(10) Pick edge 1-2 since including this edge result in cycle.

(11) Pick edge 3-4 no cycle is formed



Q5= Question # 5

Ans:- Operation research is a quantitative approach that solves problems using a number of mathematical techniques. It is helpful to use operation research when you are trying to make decisions but the condition are uncertain and when differing objective are in conflict with each other.

Advantages of OR in daily life:-

These mathematical techniques used in operation research help managers do their job more effectively. The mathematical models of OR allow people to analyze a greater number of alternatives and constraint than whould usually be possible, if they were to use only an intutive approach.

It is easier to analyze multiple alternatives, which results in greater confidence in the optimal choice.

Operation research has envolved into a standard framework that's used for identifying and solving problems.

The steps that are as follow:

- Orientation
- Defining problems.
- collecting data.
- Formulating constrants & Objectives
- Solutions
- Validating the problem an output analysis.
- Implementing & monitoring.

* End of Paper *