

Name = naveed

Id = 14703

Program = BS(SE)

Paper = Operation research

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Qno: ① :- "5"

Write a detailed note on how this course (operation Research) will help you in your professional life?

Ans:-

Research (OR) is an analytical method of problem - solving and ~~decision~~ decision - making that is useful in the management organization. Operation Research defines steps by steps mathematical analysis-

Steps:-

- 1) Identifying a problem that need to be solved.
- 2) Constructing a model around the problem that resemble the real world and variable.
- 3) Using the model to derive the solution to the problem.

②

- 4) Testing each solution on the model and analyzing its success.
- 5) Implementing the solution to the actual problem.

Characteristics of operation Research:-

- 1) The purpose of operation Research is to achieve the best performance under the given circumstance.
- 2) This involves building models or replication in order to try out and test solution before applying them.
- 3) This includes using mathematical algorithms.

Use of operation Research:-

operation Research can be applied to a change use of cases.

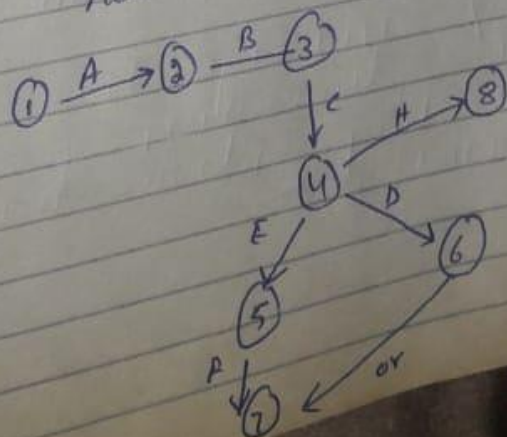
- * Scheduling and time management.
- * Urban and agricultural planning
- * Enterprise resource planning and "CRM"
- * Inventory management
- * Network optimization & engineering
- * Packet routing optimization
- * Risk management

Q70 :- "2"
The given table shows the detail of project?

Activity	Predecessor	Optimistic Time (O)	Most Likely Time (M)	Pessimistic Time (P)
A	-	4	5	12
B	A	2	3	4
C	B	6	9	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 and variance for each activity.
c: Find the critical path and expected project completion time.

Ans: Solution:- (A) Construct the project network.



Solution (B)

Activity	Predecessor	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	9	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

$$(mean) \quad te_1 = \frac{to + 4tm + tp}{6}$$

$$= \frac{4 + 4(5) + 12}{6} = \frac{4 + 20 + 12}{6} = 6$$

$$te_2 = \frac{2 + 4(3) + 4}{6} = \frac{2 + 12 + 4}{6} = 3$$

$$te_3 = \frac{6 + 4(8) + 22}{6} = \frac{6 + 32 + 22}{6} = 10$$

$$te_4 = \frac{4 + 4(6) + 8}{6} = \frac{4 + 24 + 8}{6} = 6$$

$$te_5 = \frac{3 + 4(4) + 5}{6} = \frac{3 + 16 + 5}{6} = 4$$

$$te_6 = \frac{2 + 4(4) + 6}{6} = \frac{2 + 16 + 6}{6} = 4$$

$$\text{e.g. } = \frac{2 + 4(2) + 4}{6} = \frac{2 + 12 + 4}{6} = 3$$

$$\text{e.g. } = \frac{5 + 4(2) + 15}{6} = \frac{5 + 28 + 15}{6} = 8$$

Variance (6)

By Formula

$$s^2 = \left(\frac{LP - to}{6} \right)^2$$

$$b_1^2 = \left(\frac{12 - 4}{6} \right)^2 = \left(\frac{8}{6} \right)^2$$

$$= (1.33)^2$$

$$= 1.77$$

$$b_2^2 = \left(\frac{4 - 2}{6} \right)^2 = \left(\frac{2}{6} \right)^2$$

$$= 0.11$$

$$b_3^2 = \left(\frac{22 - 6}{6} \right)^2 = \left(\frac{16}{6} \right)^2 = 7.09$$

$$b_4^2 = \left(\frac{8 - 4}{6} \right)^2 = \left(\frac{4}{6} \right)^2 = 0.44$$

$$b_5^2 = \left(\frac{5 - 3}{6} \right)^2 = \left(\frac{2}{6} \right)^2 = 0.11$$

$$b_6^2 = \left(\frac{6 - 2}{6} \right)^2 = \left(\frac{4}{6} \right)^2 = 0.44$$

$$b_7^2 = \left(\frac{4 - 2}{6} \right)^2 = \left(\frac{2}{6} \right)^2 = 0.11$$

10

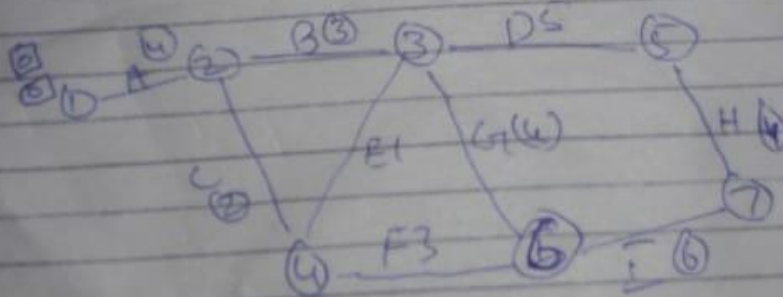
Question I

The given Table Shows the details of Project.

Activity	Predecessor(s)	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

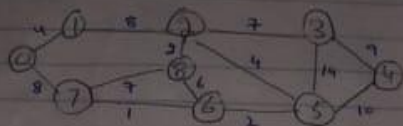
a) calculate the cpm network



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

Q No. 4

For the following graph, find the minimum spanning tree using Kruskal's algorithm.



Solution:

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

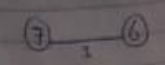
After Sorting:

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

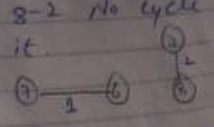
Weight	Src	Dest
10	5	4
11	1	7
14	3	5

Now pick all edges one by one from sorted list of edges.

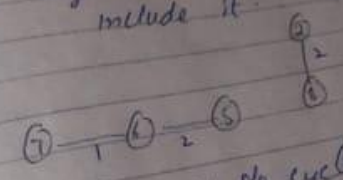
1. Pick edge 7-6. No cycle is formed. Include it.



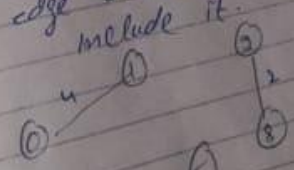
2. Pick edge 8-2. No cycle is formed. Include it.



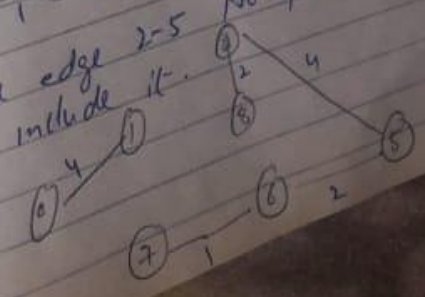
3. Pick edge 6-5. No cycle is formed. Include it.



4. Pick edge 0-1. No cycle is formed. Include it.



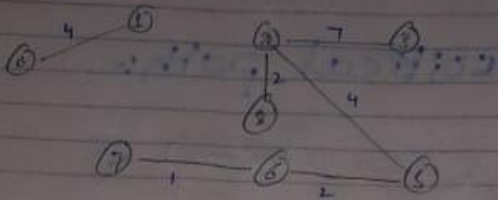
5. Pick edge 2-5. No cycle is formed. Include it.



Algorithm stops.

6: Pick edge 3-6 since including this edge result in cycle, discard it.

2: Pick edge 2-3 No cycle is formed include it.

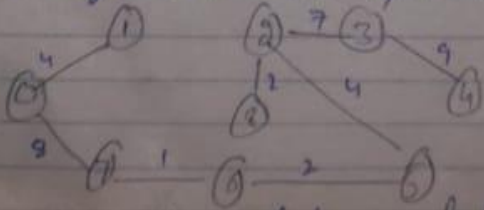


8: Pick edge 7-8 Since including this edge result in cycle discard it.

9. Pick edge 0-7 No cycle is formed.
Include it.

10: Pick edge 1-2. Since including this edge result in cycle, discard it

11. Pick edge 3-4. No cycle is formed include it.



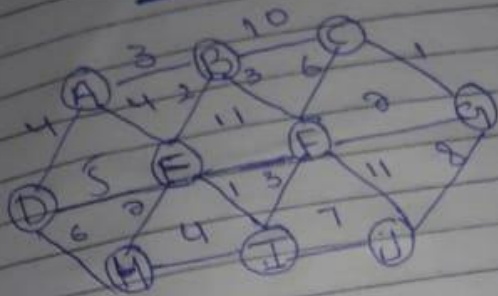
Since

The number edge include equal $v-1$ algorithm starts here.

$$4 + 2 + 1 + 4 + 6 = 17$$

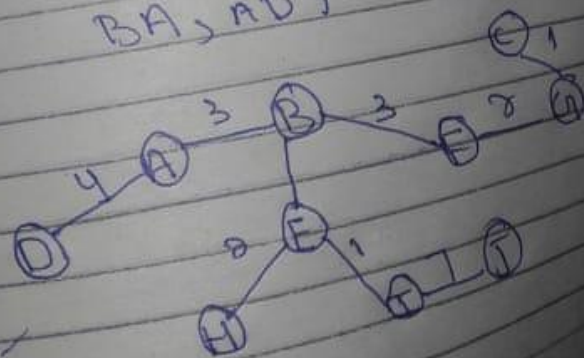
Q70 :- "3"

Answer:-

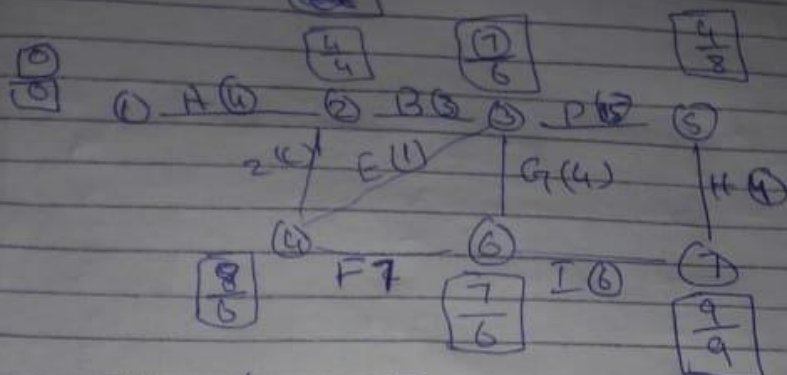


now we have connected all the vertices and minimum spanning tree look like this

The minimum spanning tree is cut at edge
 (C, G), (G, F), (B, C), (B, E), (E, I), (I, J), (E, H),
 (B, A), (A, D)



15 Determine the critical path and project completion time.



We know that

$$ES_j = \max(ES_i + D_{ij})$$

$$\text{For Node 1} = ES_1 = 0$$

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

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

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

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

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

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

