Name : Mujahid khan.

ID = 14582.

Section = (A) BS(SE)

Subject = Operation Research

class timing : Monday

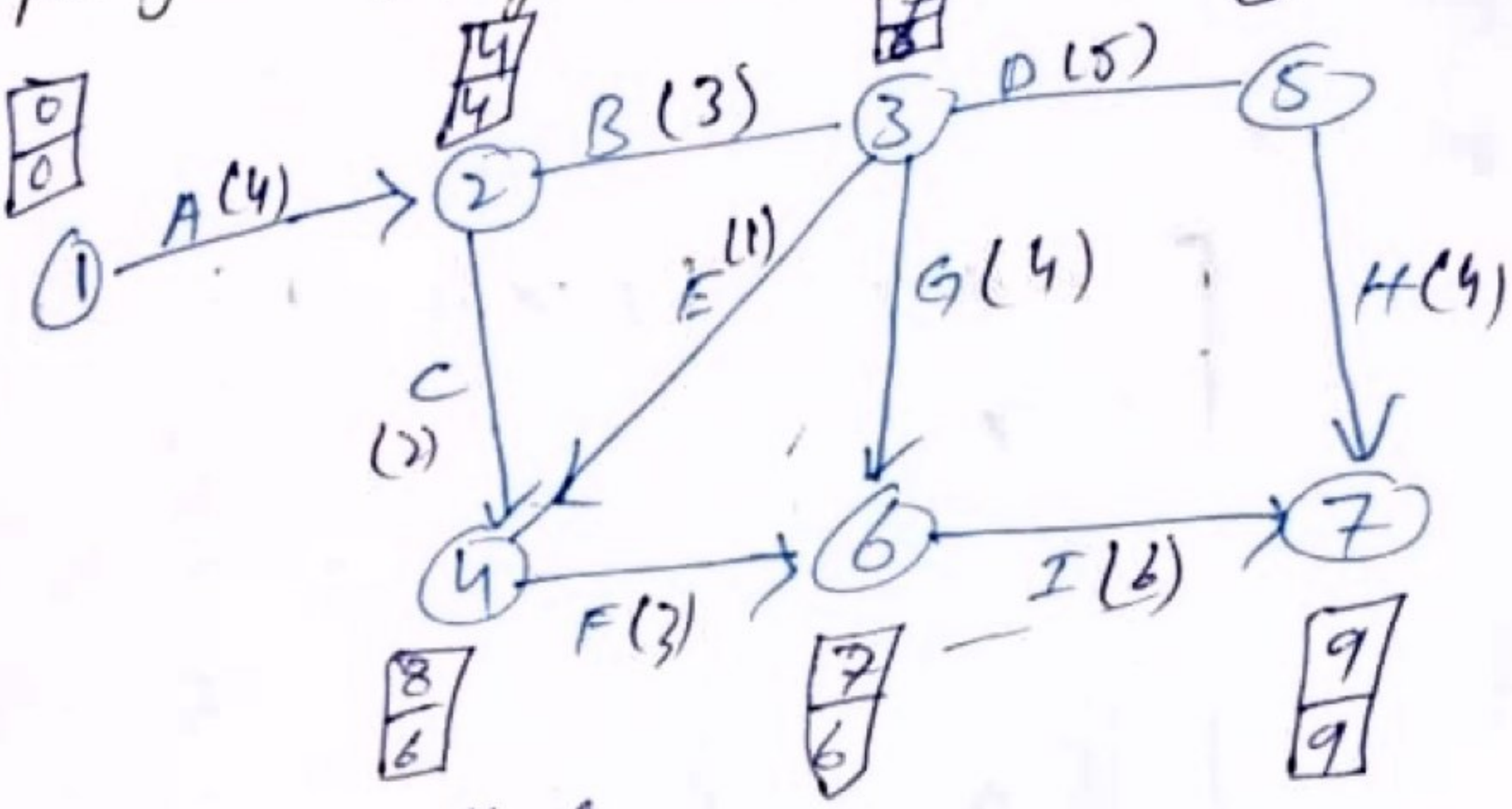
Final term Assignment.

Date = 23/06/2020

Submitted to = Sir Saif ullah Jansh

Activity	predessor(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

b) Determine the critical path and project completion time.



We know that

$$E_{sj} = \text{Max}\,(E_{si} + D_{ij})$$

For Node 1 : $E_{s_1} = 0$

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

compute total float and free float

Float for non critical activities.

For total float we know that.

$$T_{Fi} = Lcj - Esi - Dij$$

Activity		Duration (Di)	Total F	F.F
A	1-2	4	1	1
B	1-3	3	4	5
C	1-4	2	3	
D	3-4	5	2	
E	2-5	1	1	
F	2-6	3	2	
G	3-6	4	3	
H	4-5	4	2	
I	1-5	6	3	

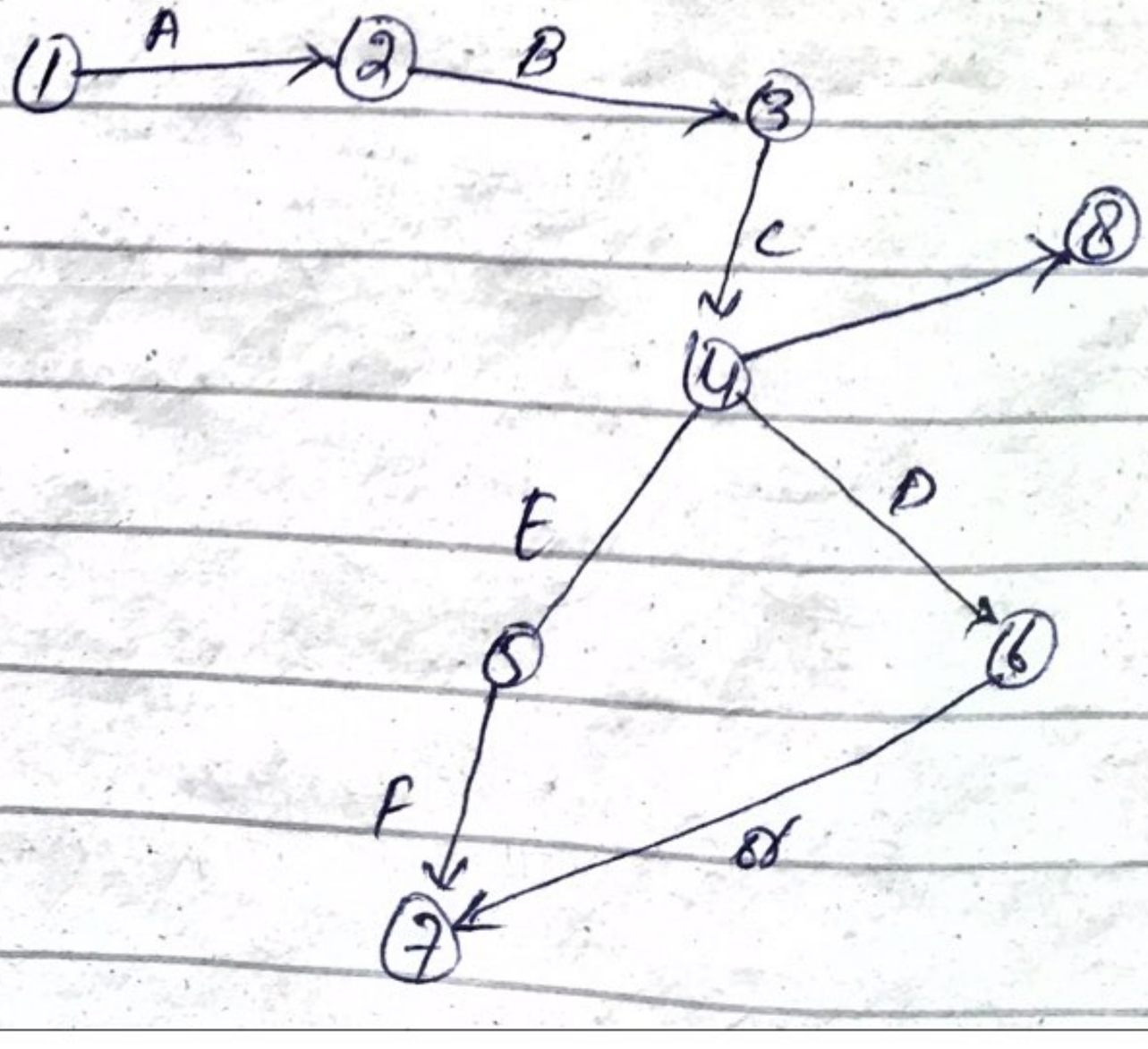
Total Float = $LCj = Esi - Dij$

Question NO 2:

Activity	Predecessor	opt Time(o)	Most likely time(m)	Pessim stic time (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

Solution →

(a) Construct the project network -



(4)

(b)

Activity	Predecessor	o	M	P	Mean / 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 -

$$(\text{Mean})\ te_1 = \frac{to + 4tm + tp}{6}$$

$$= \frac{4 + 4(5) + 12}{6} = \frac{4 + 20 + 12}{6} = 16$$

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

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

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

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

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

$$te_7 = \frac{2+4(3)+4}{6} = \frac{2+12+4}{6} = 3.$$

$$te_8 = \frac{5+4(7)+15}{6} = \frac{5+28+15}{6} = 8$$

Variance (6^2) :-

By Formula-

$$6^2 = \frac{(tp - to)^2}{6}$$

$$6_1^2 = \frac{(12-4)^2}{6} = \left(\frac{8}{6}\right)^2 = (1.33)^2 = 1.77$$

$$6_2^2 = \frac{(4-2)^2}{6} = \left(\frac{2}{6}\right)^2$$

$$6_3^2 = \frac{(22-6)^2}{6} = \left(\frac{16}{6}\right)^2 = 7.09$$

$$6_4^2 = \left(\frac{8-4}{6}\right)^2 = \left(\frac{4}{6}\right)^2 = 0.44$$

$$6_5^2 = \left(\frac{5-3}{6}\right)^2 = \left(\frac{2}{6}\right)^2 = 0.11$$

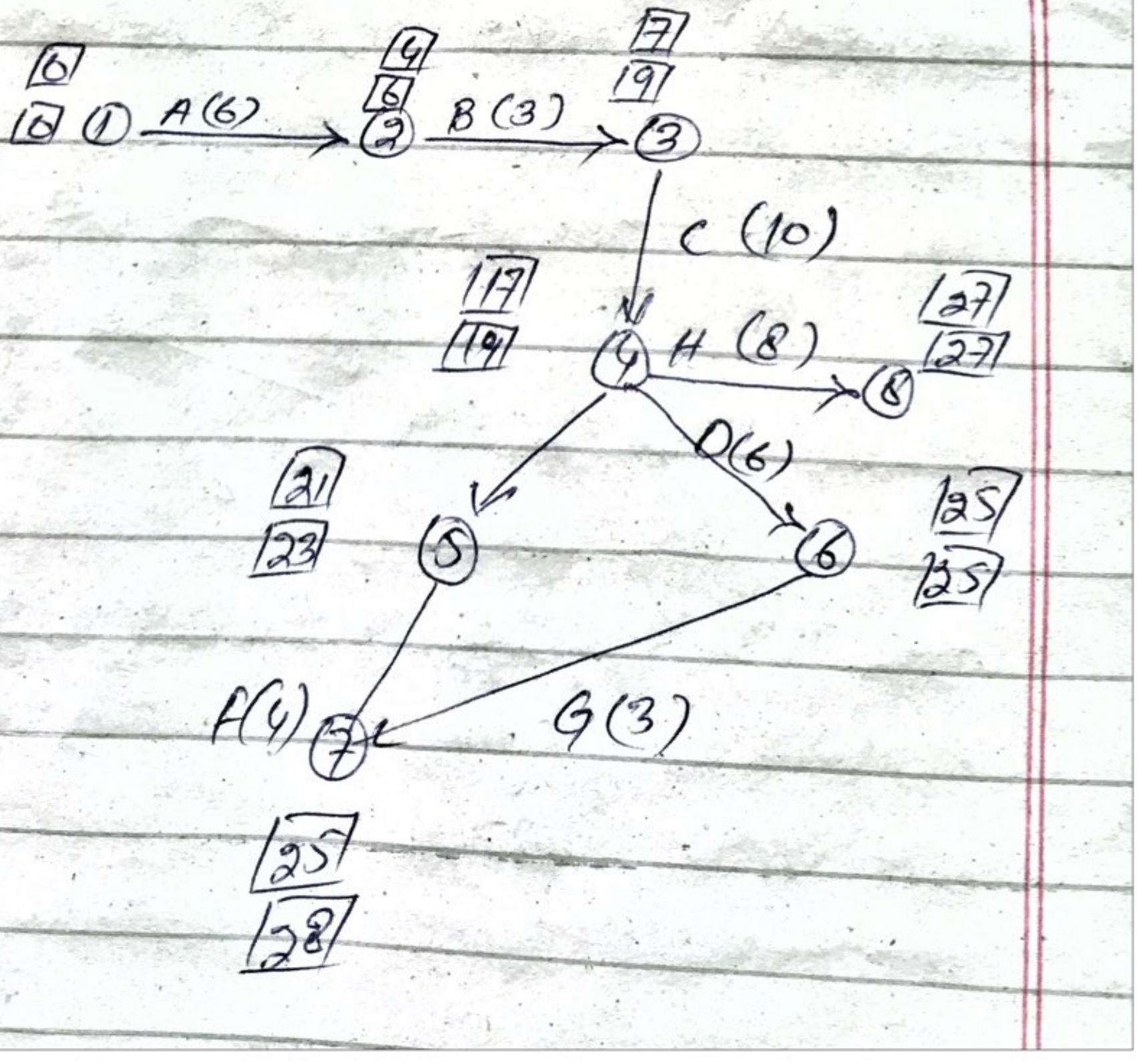
$$6_6^2 = \left(\frac{6-2}{6}\right)^2 = \left(\frac{4}{6}\right)^2 = 0.44$$

$$6_7^2 = \left(\frac{4-2}{6}\right)^2 = \left(\frac{2}{6}\right)^2 = 0.11$$

$$6_8^2 = \left(\frac{15-5}{6}\right)^2 = \left(\frac{10}{6}\right)^2 = 2.76$$

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

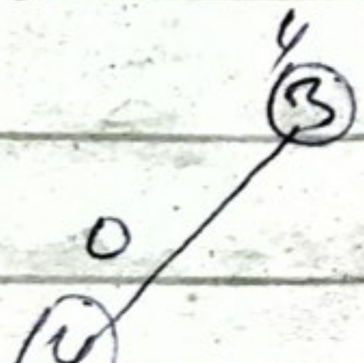
Critical Path:



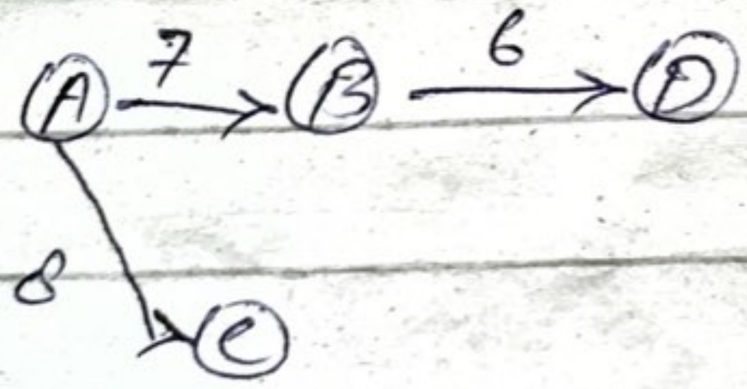
Question No-3-

Answer ⇒

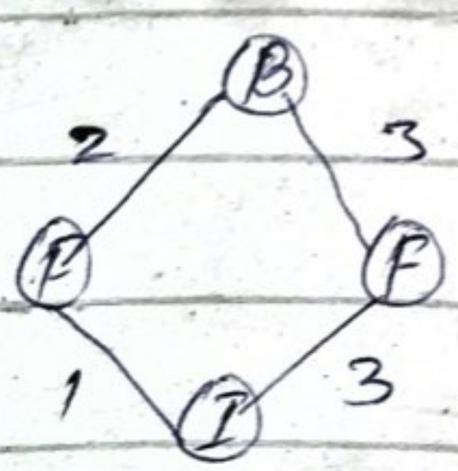
Prims algoritlems to find minimum cost sparming treats the node as a single tree and keep on adding new nodes to the spinning tree-



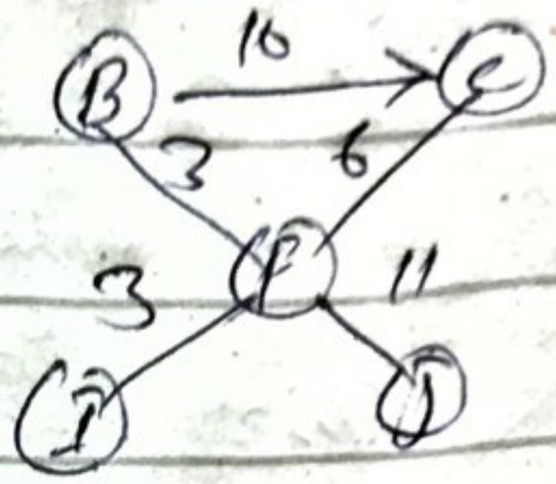
Pick the vertix with minimum key value and not already included vertix



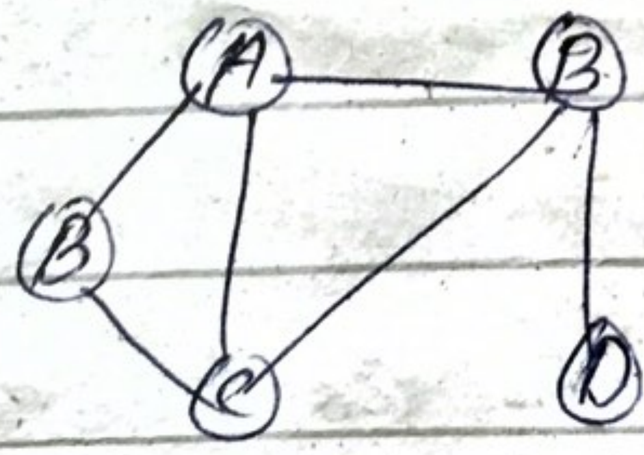
Remove all loops vertex edges from the given graph-



→ In this case we choose B node as the root of primes spanning tree -

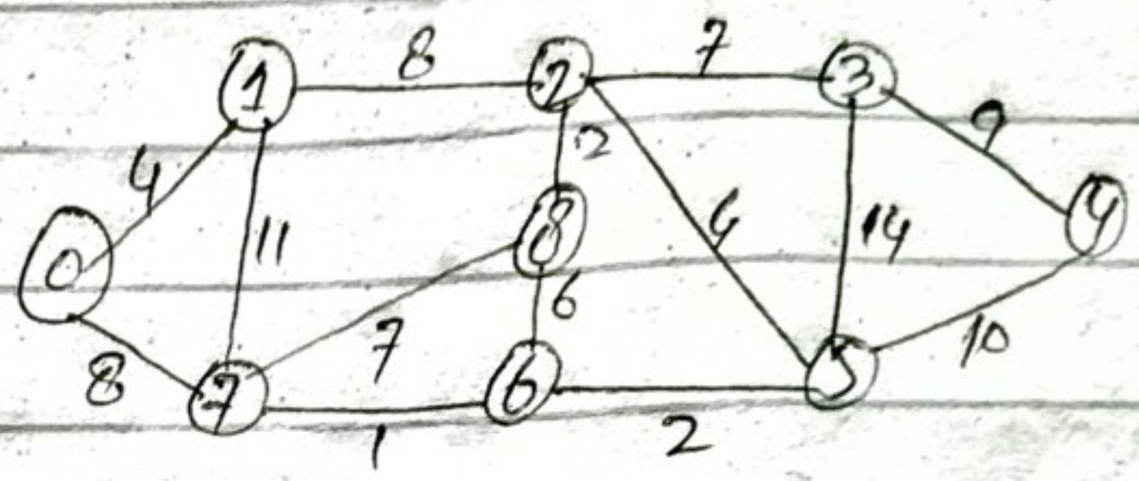


→ Now we select tree 5-7 B treated as one node and we check for all edges going out from it we select the one which has the lowest cost and include it on the tree -



we choose the edges -

Q NO 4:→ For the following graph find the minimum Spanning tree using Kruskal's algorithm?



Ans 4 ⇒

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

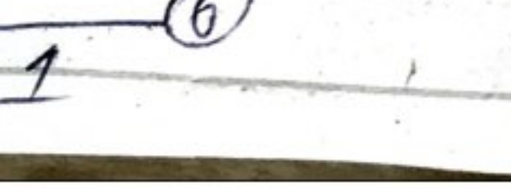
After Sorting =

Weight	Src	Dest
1	7	6
2	8	2
2	6	5
4	0	1
4	2	5

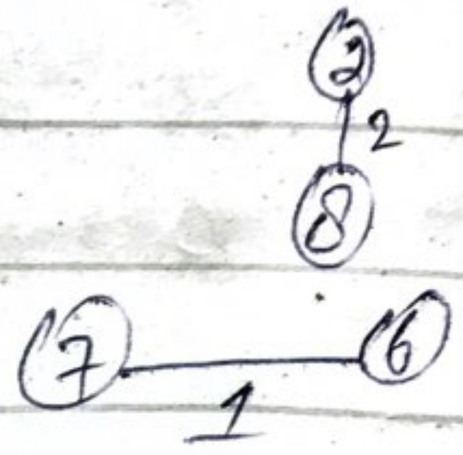
Weight	Src	Dest
6	8	6
7	2	3
7	7	8
8	0	7
8	1	2
9	3	4
10	5	4
11	1	7
14	3	5

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

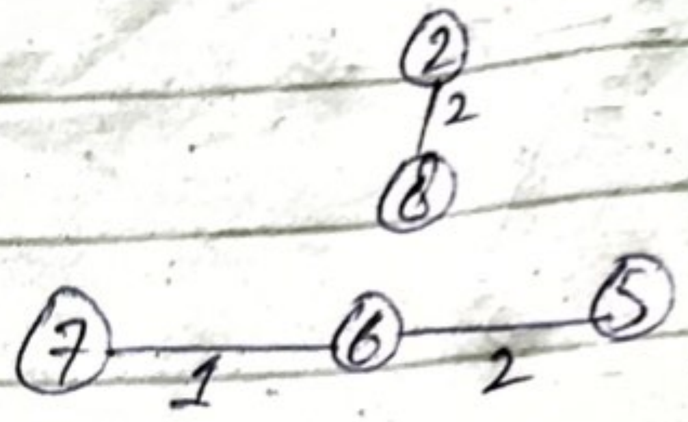
(1) → Pick edge 7-6: No cycle is formed include it.



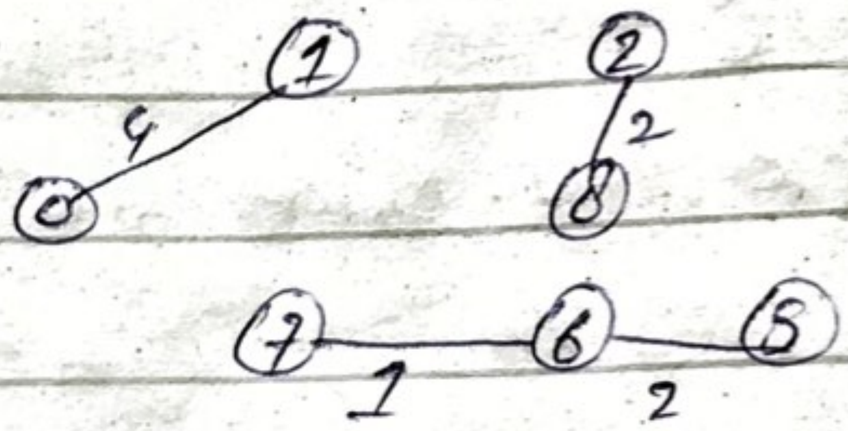
(2) → Pick edge 8-2: No cycle is formed include it.



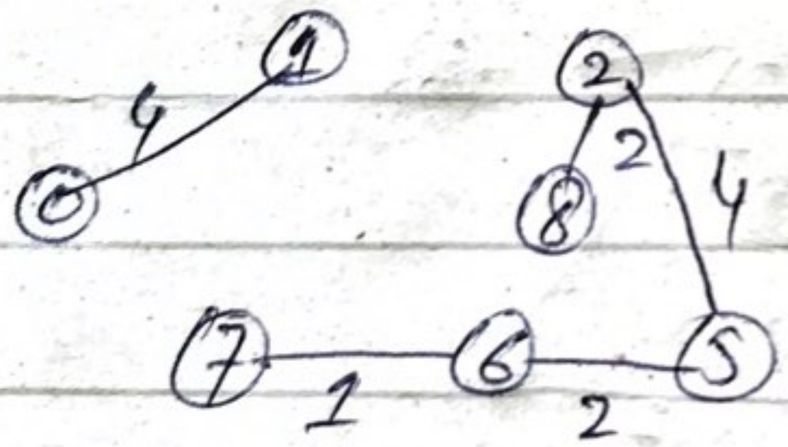
(3) → Pick edge 6-5: No cycle is formed include it -



(4) → Pick edge 0-1: No cycle is formed include it -

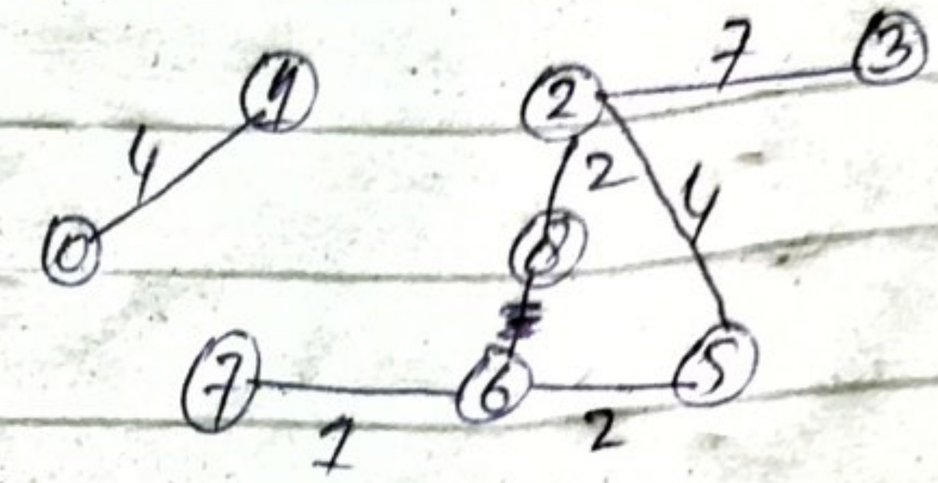


(5) → Pick edge 2-5: No cycle is formed include it.



(6) Pick edge 8-6: Since including this edge results in cycle discard it -

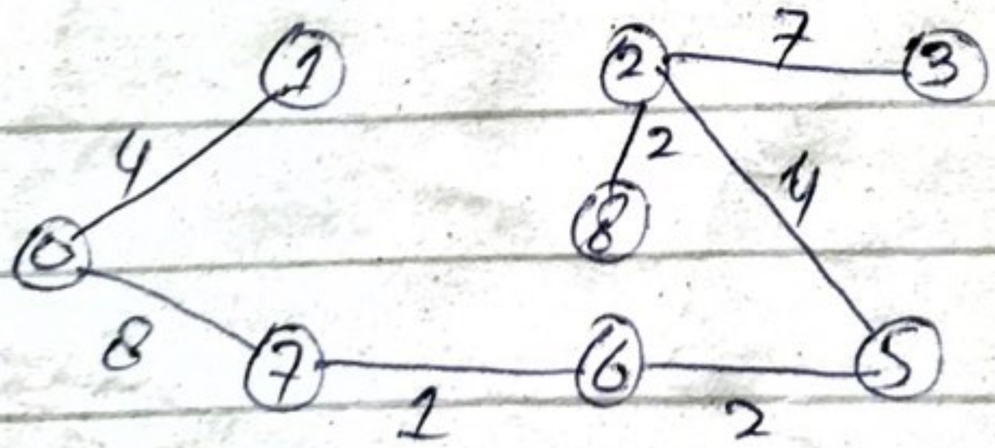
⑦ Pick edge 2-3: No cycle is formed include it-



⑧ → Pick edge 7-8: Since including this edge suits in cycle discard it-

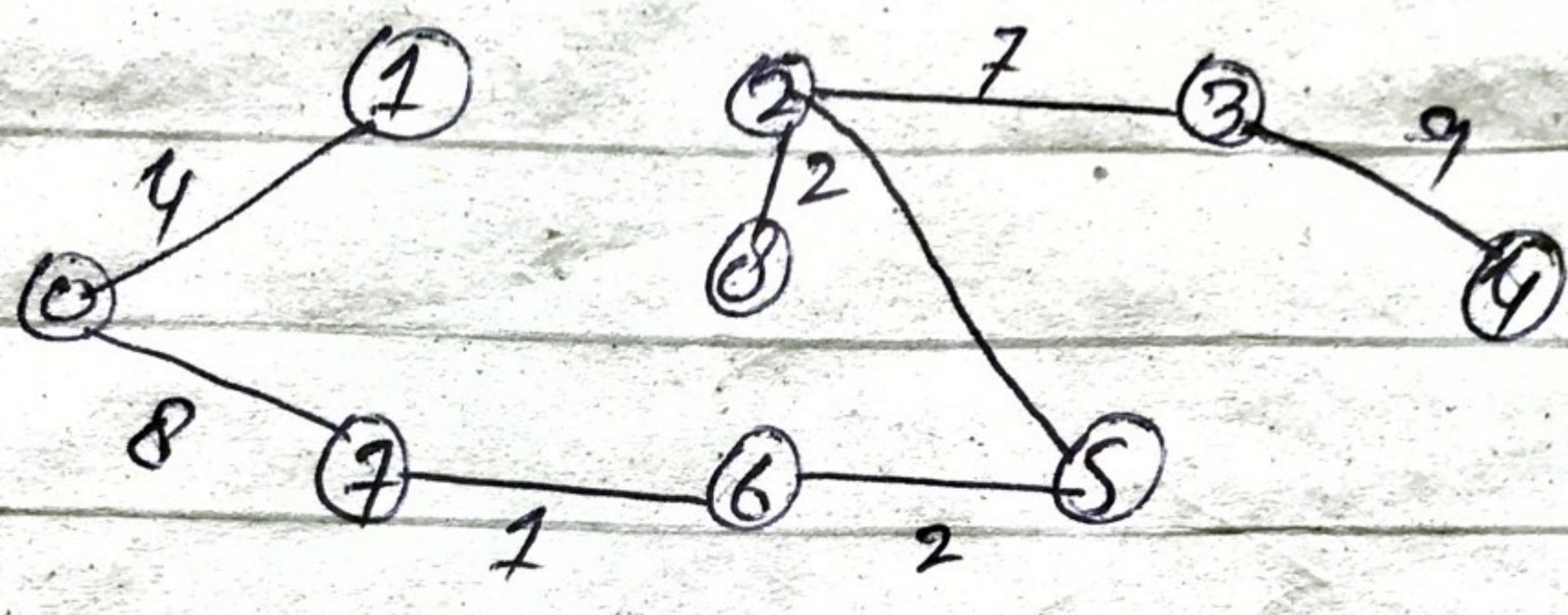
⑨ → Pick edge 0-7: Since including this edge results in cycle

⑨ → Pick edge 0-7: No cycle is formed include it.



⑩ → Pick edge 1-2: Since including this edge results in cycle discard it-

(11) → Pick edge 3-4 : no cycle is formed include it -



Since the number of edges include (V-1) the algorithm stops here -

Q NO 5 :-

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

Ans 5 →

Operation Research help me in my professional life that one. These mathematical techniques used in operations research research help me do their jobs more effectively. Managers or other persons use techinques of operations research to maintain better control over their subordinates. This is possible because operation research provides a basis in which to establish standards of performance and ways to measure productivity.

Reporting deviations from standards enables people to identify problem areas and to take corrective action. operation research analysis blends together the objectives of different departments. For example, operations research coordinates the aims of the marketing department with the schedules of the production department. The diverse techniques of operation research including mathematical programming, simulation decision analysis are all proven with hundreds of sussesful case studies At the same time each application area is evolving, so you constantly have the opportunity to learn new things