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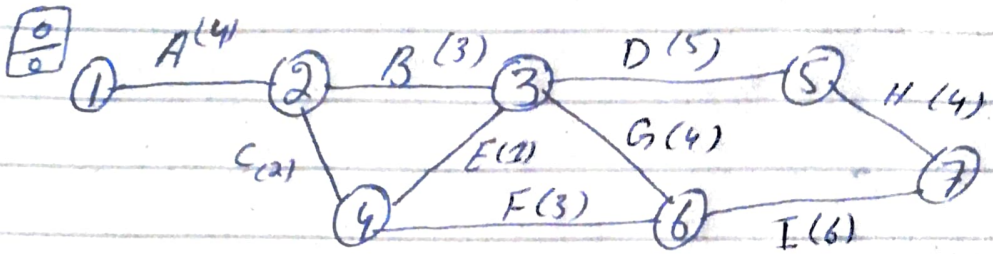
I.D : 14481

Section : BS(SE-4)(A)

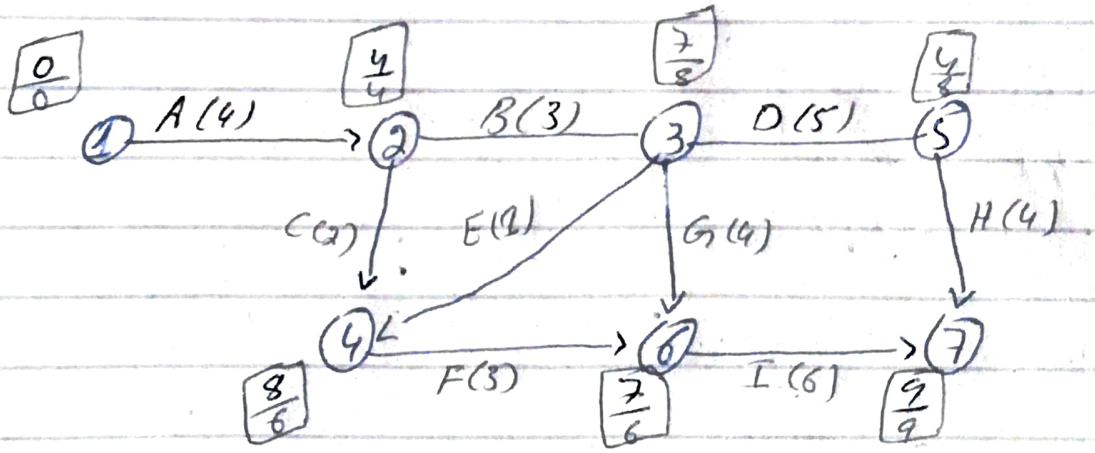
Subject : Operation Research

Q: Answer:

a) Calculate the CPM network



b) Determine the critical path and Project completion time



we know that

$Es_j = Max(Es_i + Dij)$

for Node 1 = $Es_1 = 0$

Node 2 = 0+4 = 4

Node 3 = 4+3 = 7

Node 4 = 3+1 = 4

Node 5 = 3+5 = 8

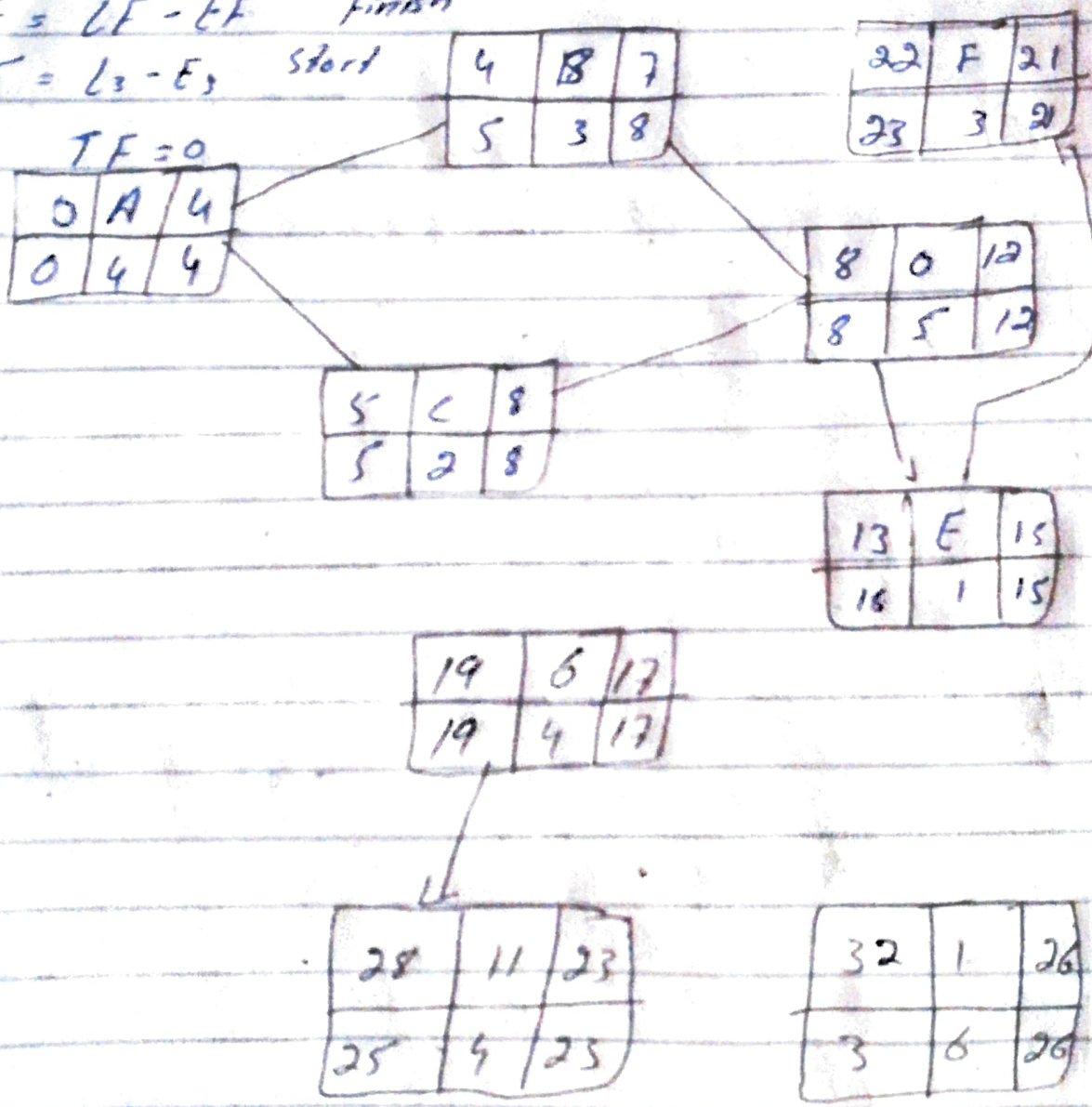
Node 6 = 3+4 = 7

Node 7 = 5+4 = 9

(C) Compute total floats and free floats for non-critical activities

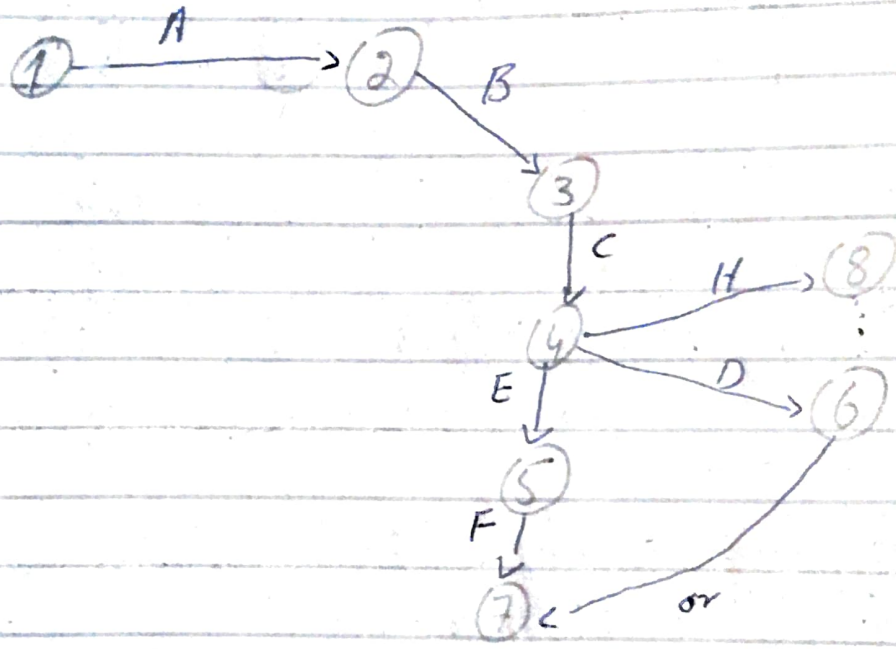
$TF = LF - EF$ Finish

$TF = L_3 - E_3$ Start



Question 2

a) Solution



b) Solution:

By formula

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

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

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

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

Q4

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

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

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

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

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

Variance (σ^2) :-

By formula

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

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

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

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

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

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

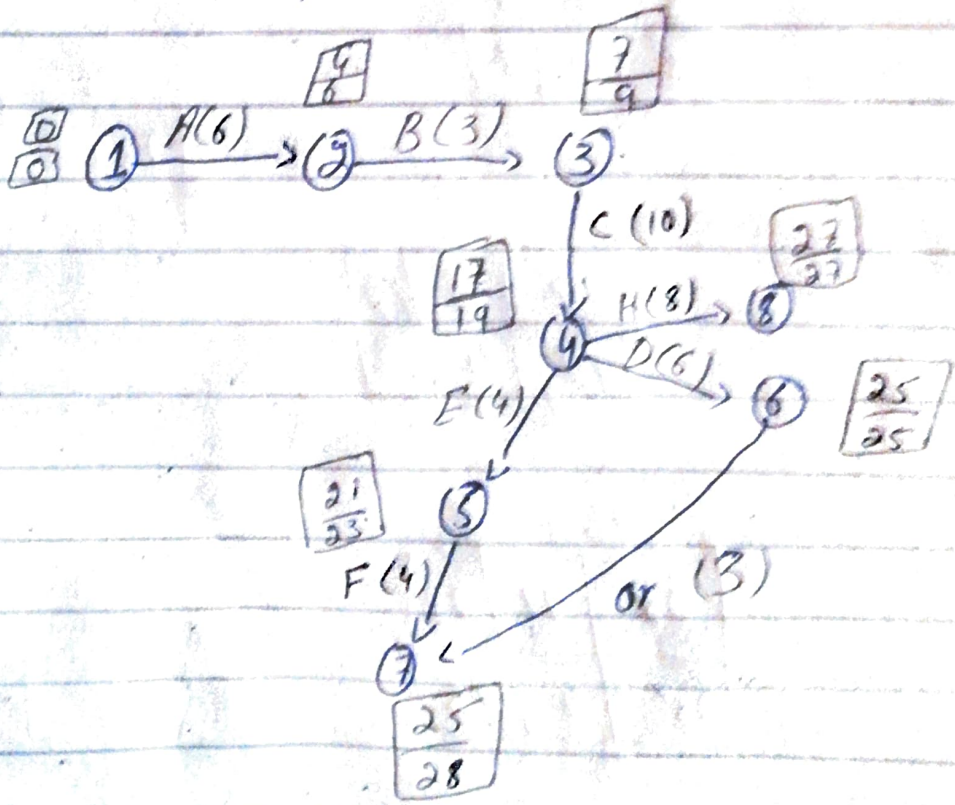
$$\sigma_6^2 = \frac{(6-2)^2}{6} = \left(\frac{4}{6}\right)^2 = 0.44$$

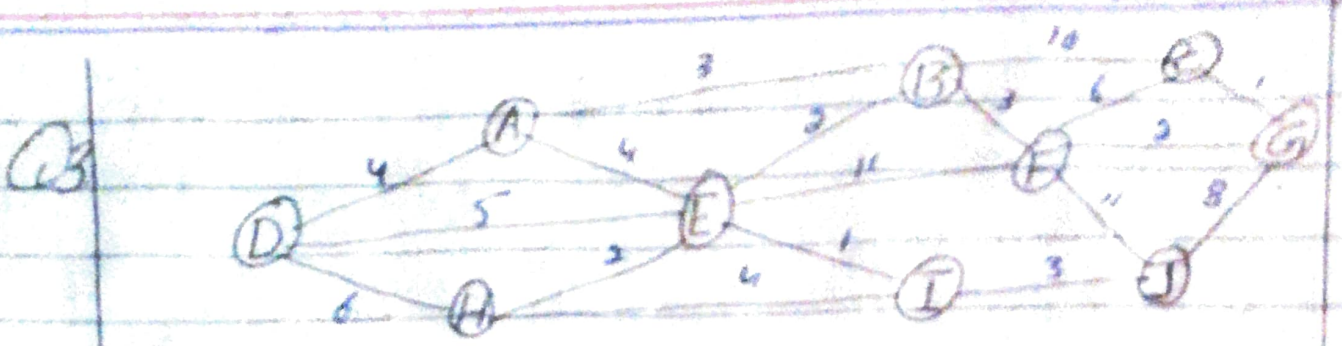
$$\sigma_7^2 = \left(\frac{4-2}{6}\right)^2 = \left(\frac{2}{6}\right)^2 = 0.11$$

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

c) Find the critical path and expected project completion time

Critical path



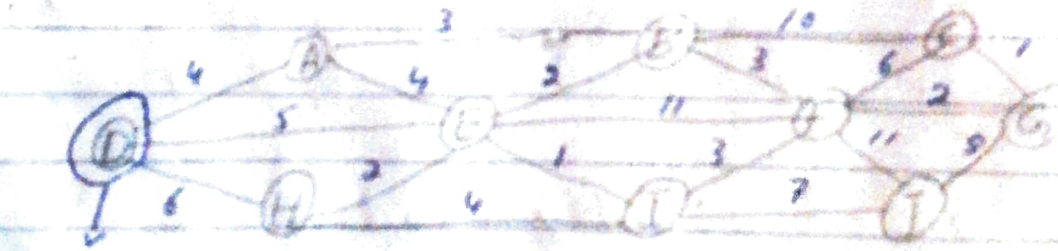


Step 1:

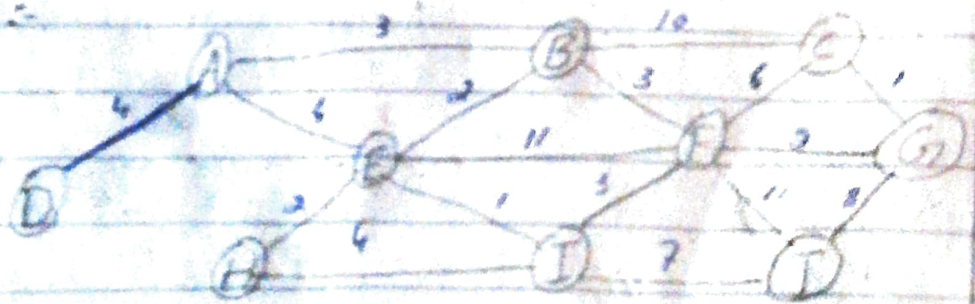
Removing all loops and parallel edges

Step 2:

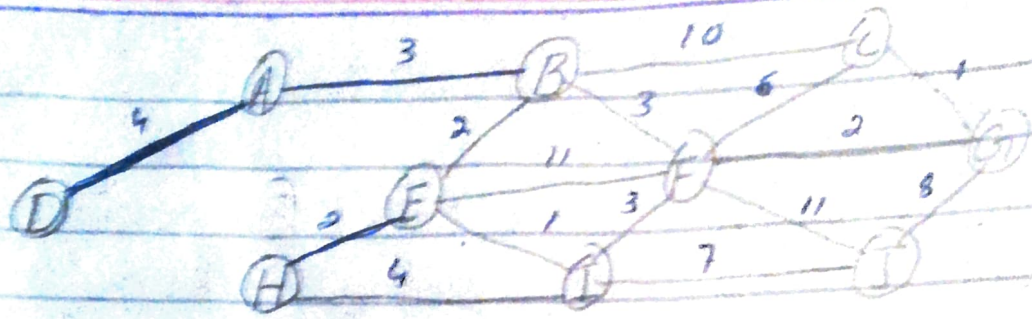
Choosing arbitary node as root node



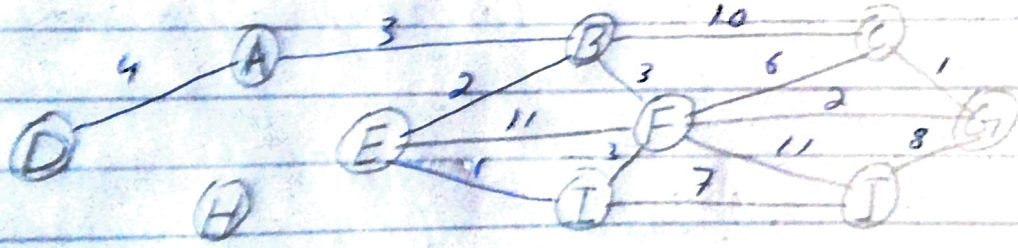
Step 3:-



Now the tree D-4 A is treated as one node and we are checking for all edges

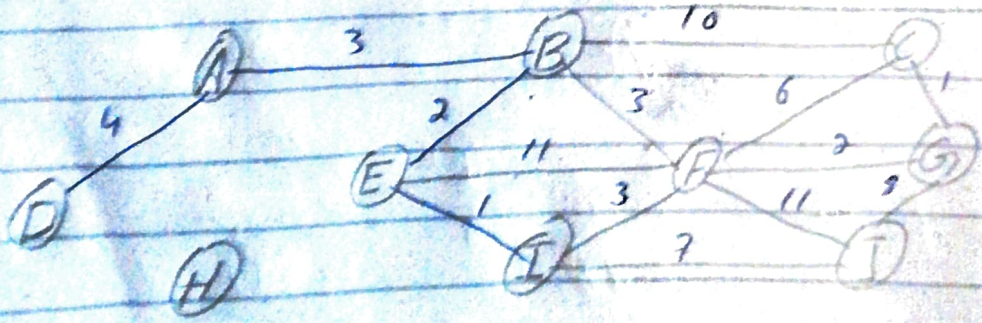


after this step D-7-A-3 tree is formed Now we will again traverse it as a node and will check the edges again



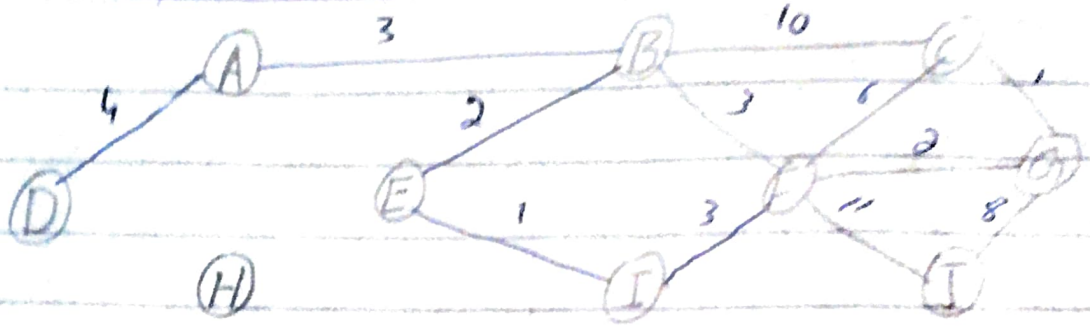
after adding Node E
D-4-A-3-B-2

Now



After adding root (I)
D-4-A-3-E-2-I-1

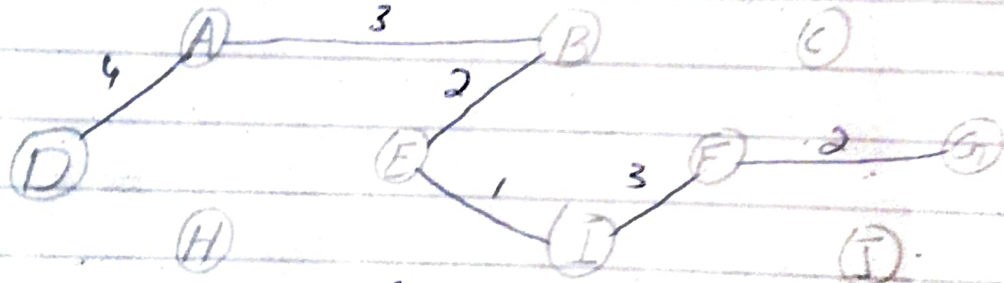
Now



Now after adding root (F)

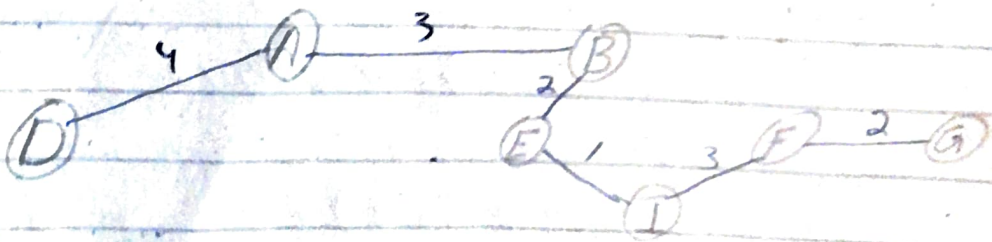
D-4-A-3-E-2-I-1-F-3

Now



Now we find that the output Spanning tree of the graph using two different algorithm is same

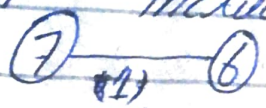
4+3+2+1+3+2 = (15)



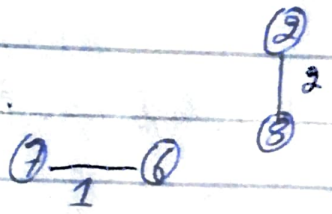
Q4: For the following graph find the minimum Spanning tree using Kruskal's algorithm.

Sol:

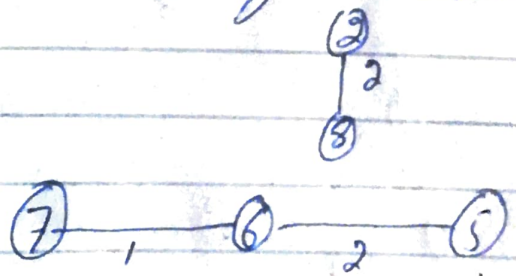
1) Formed include



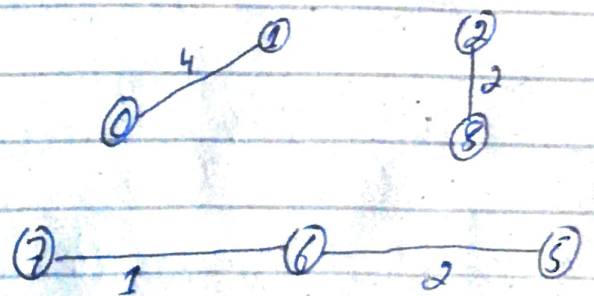
2) Picking edge 8-2 : No cycle is formed include it



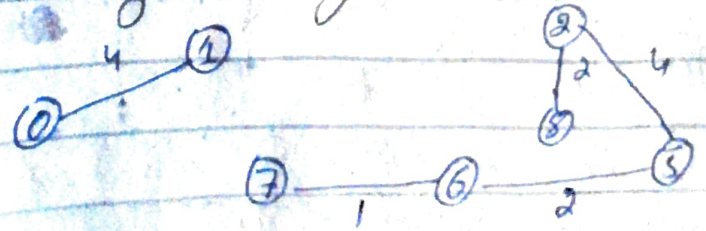
3) Picking edge 6-5 : again No cycle is forming including it



4) edge 0—1

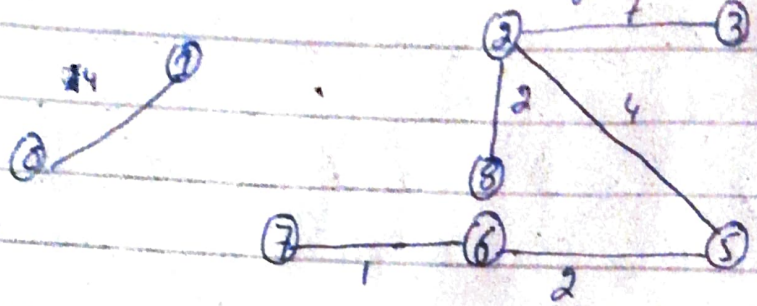


5) Picking edge 2-5



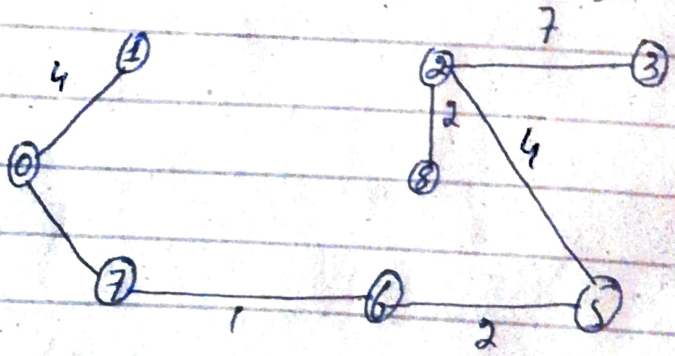
6) edge 8-6 including this edge results into cycle

7) edge 2-3 No cycle



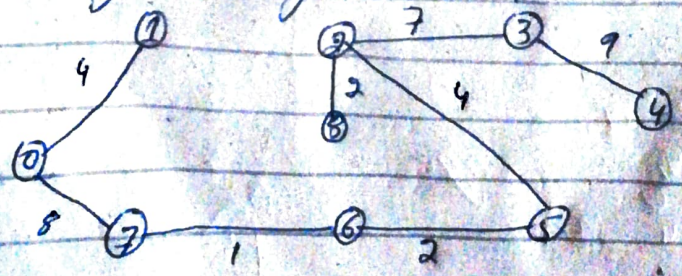
8) edge 7-8 including this edge results into cycle.

9) edge 0-7 No cycle forming



10) Picking edge 1-2 including this edge results into cycle

11) Picking edge 3-4



Since the number of edge included equals) the algorithm stop here

Q5 Write a detailed note on how this Course (Operations Research) will help you in your Professional life?

Ans: Def:

it is the method of analysis by which management receives aid for their decisions. Though the name of this method operation Research (O.R) is relatively new. The Subject of Operation was born during Second world War in U.K, and was used for military Strategy. During world War II a group of Scientists having representatives from mathematics, Statistics, physical and Social Science were entrusted to the Study of various military operation.

In life it can be used for Solving different types of problems. Such as:

i) Problems dealing with the waiting line, the arrival of units or persons requiring Service.

ii) Problems dealing with the allocation of material or activities among limited facilities.

iii) Equipment replacement problems
iv) Problems dealing with Prob production processing i.e production Control and material Shipment.

In the more wide sense, operation Research does not deal with the everyday problems such as output by the one worker or machine capacity; instead it is concerned with the overall aspect of business, operation such as Somethings as the relationship b/w inventory Sales. production and Scheduling. It may also deal with the overall flow of goods and services from plants to Consumers.

The main objective of operation research is to be providing better quantitative information's for making decision. Now our aim is to learn how we can have better decision.

Scope of operation Research

In its recent years of organised development. O.R has Solved Successfully many cases of research for military, the Government and industry.

Some of problems which can analysed by operations research

1) Finance, Budgeting and Investment
   i) Cash flow, long range capital requirement, investment portfolios, dividend policies
   ii) Claim procedure, and
   iii) Credit policies
2) Marketing
   i) Product Selection, competitive actions
   ii) Number of Salesmen, frequencies of calling on and
   iii) Advertising Strategies will respect to cost and time.

Application of operation Research

1) Distribution or Transportation problems
   ii) product mix
   iii) Production planning
   iv) Assignment of personnel
   v) Agricultural production.
   vi) Financial Application.