

NAME # AWAIS MALIK

ID # 14741

DEPARTMENT #SE

SECTION # B

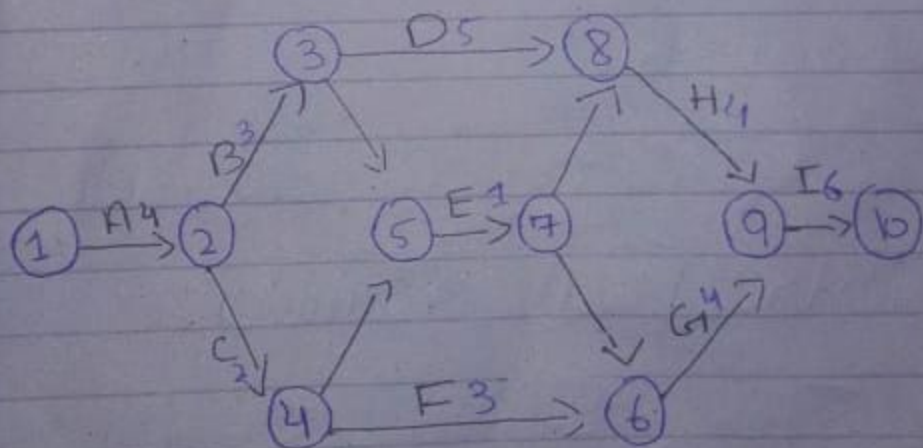
①

1)

| Activity | Predecessors | 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    |

2)

Calculate CPM Network



(2)

b) Determine the critical path and project completion

Possible paths

$$A-B-D-H-I = 4+3+5+4+6 = 22$$

$$A-B-E-H-I = 4+3+1+4+6 = 18$$

$$A-B-E-G-I = 4+3+1+4+6 = 18$$

$$A-C-E-H-I = 4+2+1+4+6 = 17$$

$$A-C-E-G-I = 4+2+1+4+6 = 17$$

$$A-C-F-G-I = 4+2+3+4+6 = 19$$

The critical path here is

$$A-B-D-H-I = 22$$

c) Free floats :-

Formula :-

$$TF_{ij} = LC_j - ES_i - D_{ij}$$

Total float formula :-

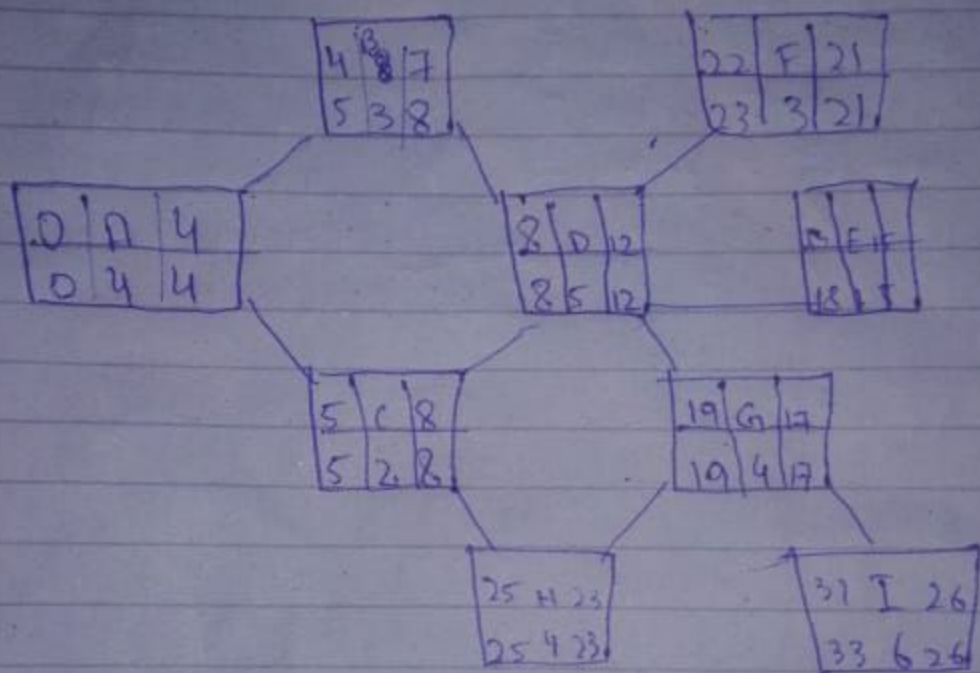
$$FF_{ij} = ES_j - ES_i - D_{ij}$$

③

c)

$$TF = LF - EF$$

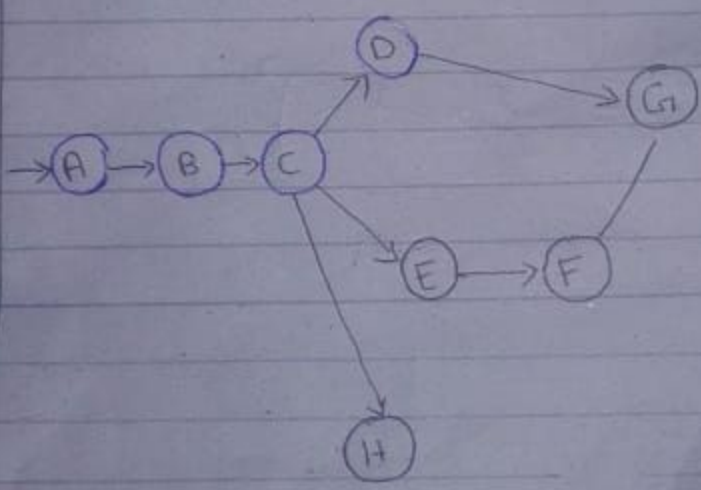
$$FF = LS - ES$$



Q2)

| Activity | Predecessor | Optimistic Tim | M | P  |
|----------|-------------|----------------|---|----|
| A        | -           | 4              | 5 | 12 |
| B        | A           | 2              | 3 | 4  |
| C        | B           | 6              | 8 | 22 |
| D        | C           | 4              | 6 | 8  |
| F        | C           | 3              | 4 | 5  |
| F        | E           | 2              | 4 | 6  |
| G        | D, F        | 2              | 3 | 4  |
| H        | C           | 5              | 7 | 15 |

(a)

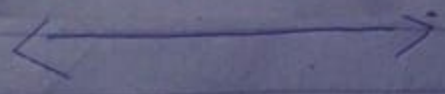


b) Expected duration and Variance

| Activity | Duration |   |    | Mean<br>(Expected duration)     | Variance                               |
|----------|----------|---|----|---------------------------------|--|
|          | O        | M | P  |                                 |  |
| A        | 4        | 5 | 12 | $\frac{4+4 \times 5+12}{6} = 6$ | $\left(\frac{12-4}{6}\right)^2 = 1.77$ |
| B        | 2        | 3 | 4  | 3                               | 0.11                                   |
| C        | 6        | 8 | 22 | 10                              | 7.11                                   |
| D        | 4        | 6 | 8  | 6                               | 0.44                                   |
| E        | 3        | 4 | 5  | 4                               | 0.11                                   |
| F        | 2        | 4 | 6  | 4                               | 0.44                                   |
| G        | 2        | 3 | 4  | 3                               | 0.11                                   |
| H        | 5        | 7 | 15 | 8                               | 2.77                                   |

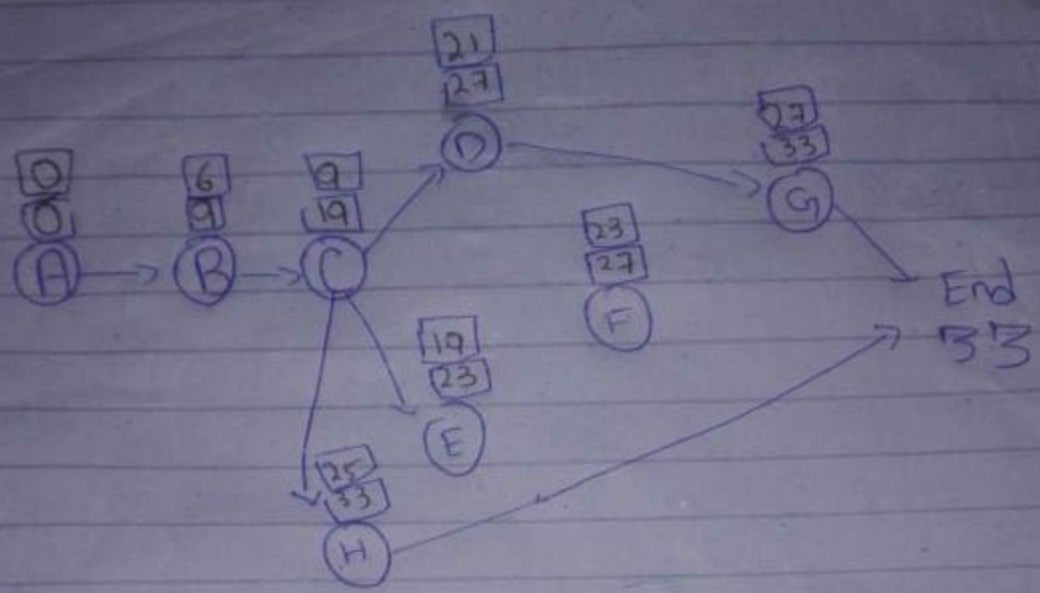
$$\text{Mean} = \frac{t_o + 4t_m + t_p}{6}$$

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



A — B — C

Part c



Critical path

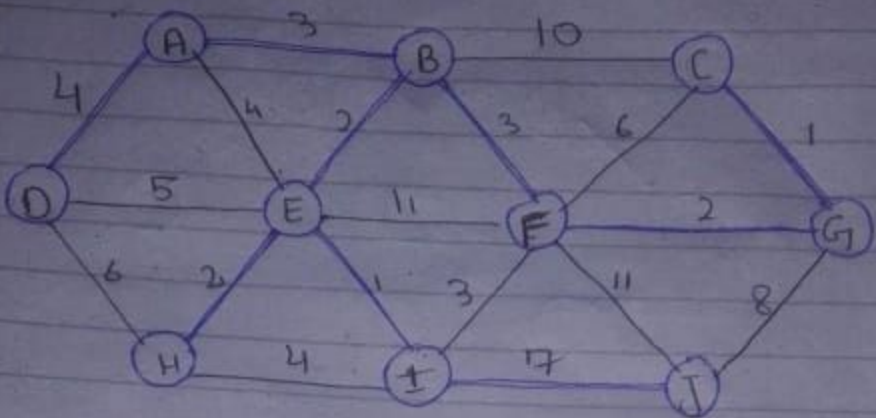
A → B → C → E → F → G

Completion time = 33 Au.



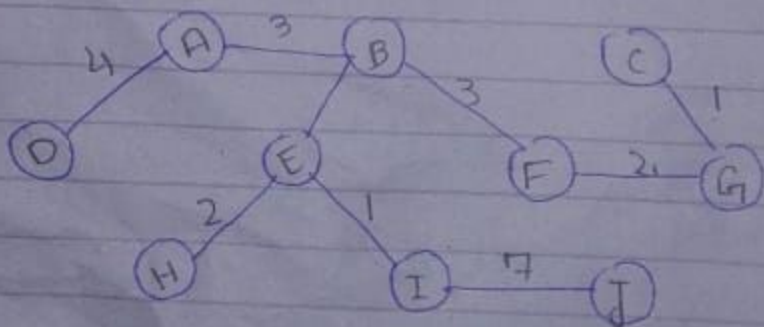
Q3 ~~Q3~~

Answer :-



Now we have connected all the vertices our minimum spanning tree looks like this

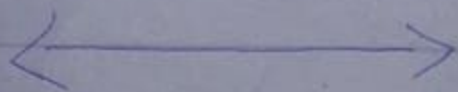
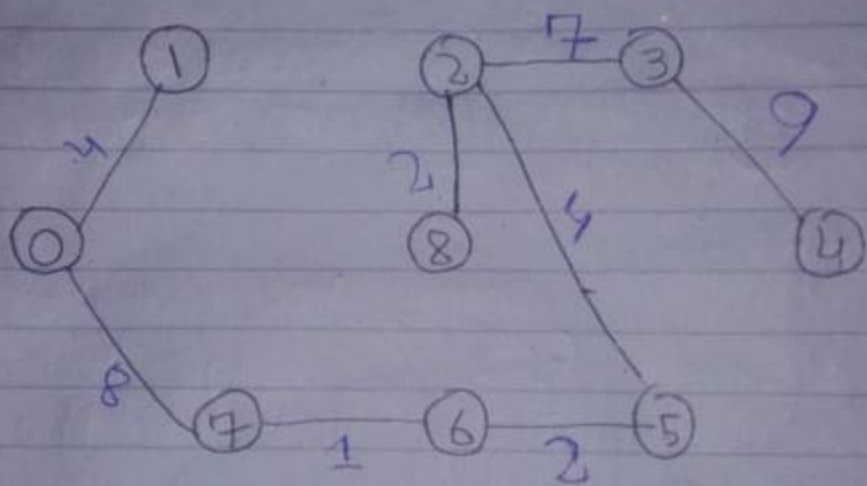
The minimum spanning tree is list of edges  
 (CG, GF, FB, BE, EI, IJ, EH, BA, AD)





Q4) For the following graph find the minimum spanning tree using Kruskal's algorithm -

Graph



Q5) Write a detail note on how this course will help you in professional life -

Answer:-

\* You have the opportunity to solve real world problem and these problems matter to organizations and have an impact -

\* This course help me to be creative and i ~~be~~ also learn analytical skill. I became very good in solving math problem -

\* I become a better strategist. The operation research discipline - looking at problems, creating models and setting up analysis that points to be better options and result helps you make better personal and professional decisions -

(9)

I become an essential link between technology departments and organizational management

This course can help me financially and get me a good job if I pursued it professionally.

The diverse techniques of OR including mathematical programming, simulation, decision analysis are all proven with hundreds of successful case studies. At the same time each application of OR is evolving, so you constantly have the opportunity to learn new things.

With OR I bring (the science of better) - tools and approaches for harvesting insight from data to make dramatic improvements throughout the organization.