ID: 14601

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Subject: Operation Research

Section: 'A'

Semester: BS(SE) 4th

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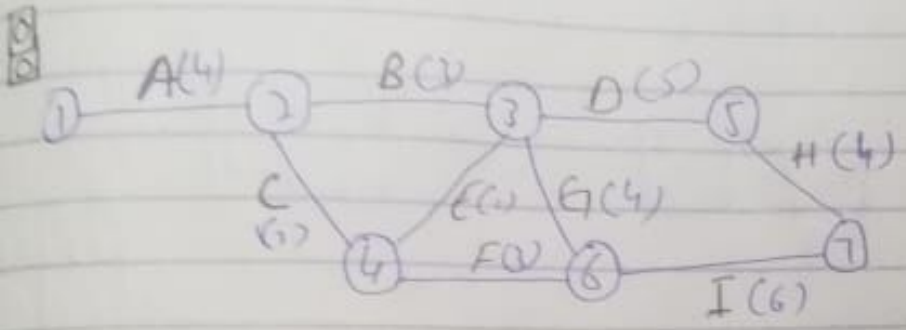
Teacher name: Saif ullah jan

Question no. 1,

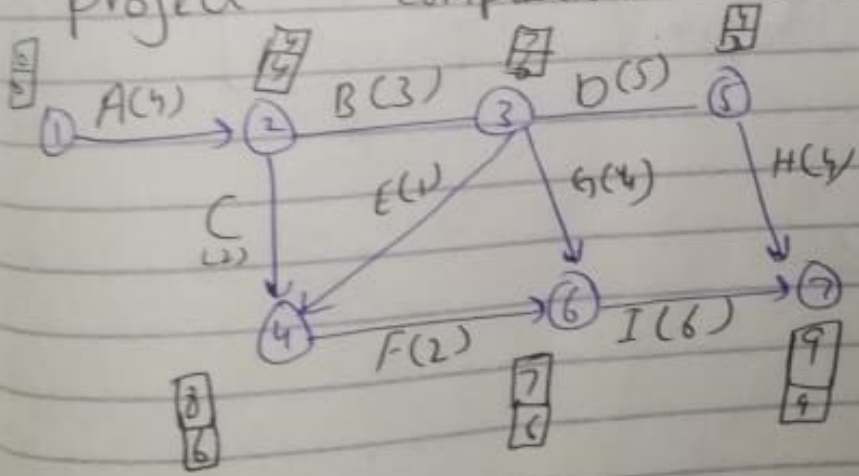
Part (a)

a) Calculate the cpm network.



Part (b)

b) Determin the ethical path and project completion time.



We know that

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

For Node 1, $E_{s1} = 0$

Node 2 = 0 + 4 = 4

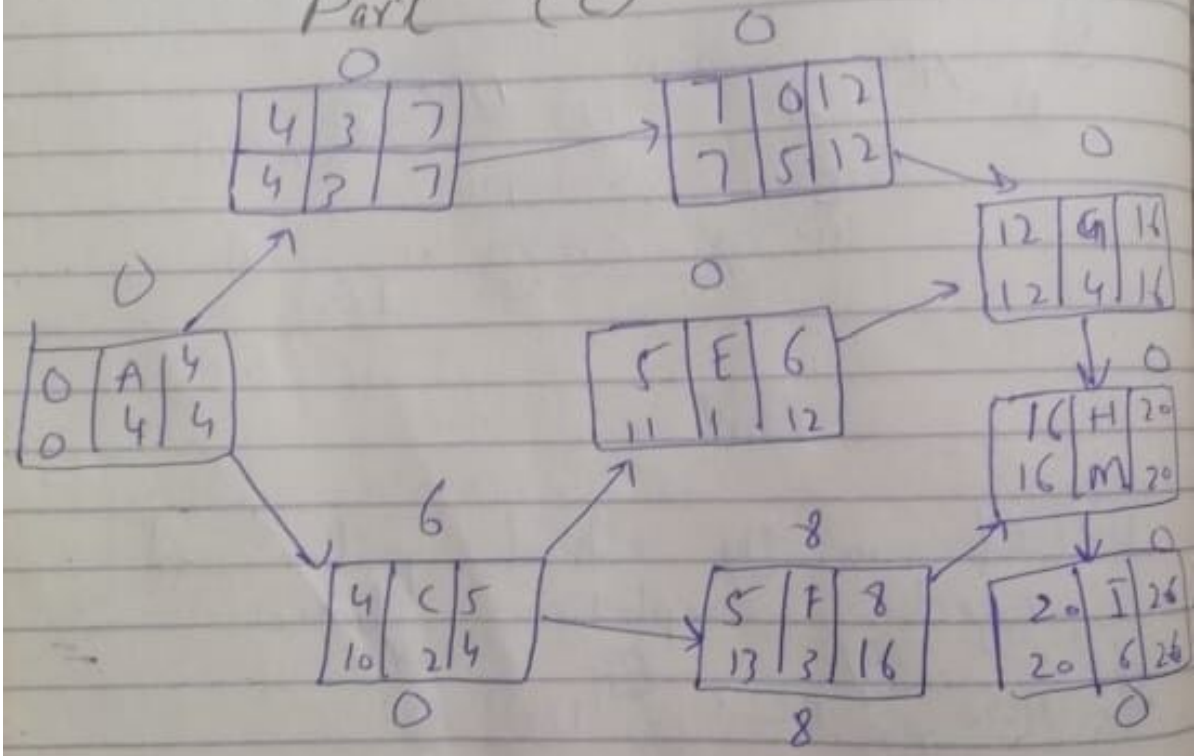
Node 3 = 4 + 3 = 7

Node 4 = 3 + 1 = 4

Node 5 = 3+5 = 8

Node 6 = 3+4 = 7
Node 7 = 5+4 = 9

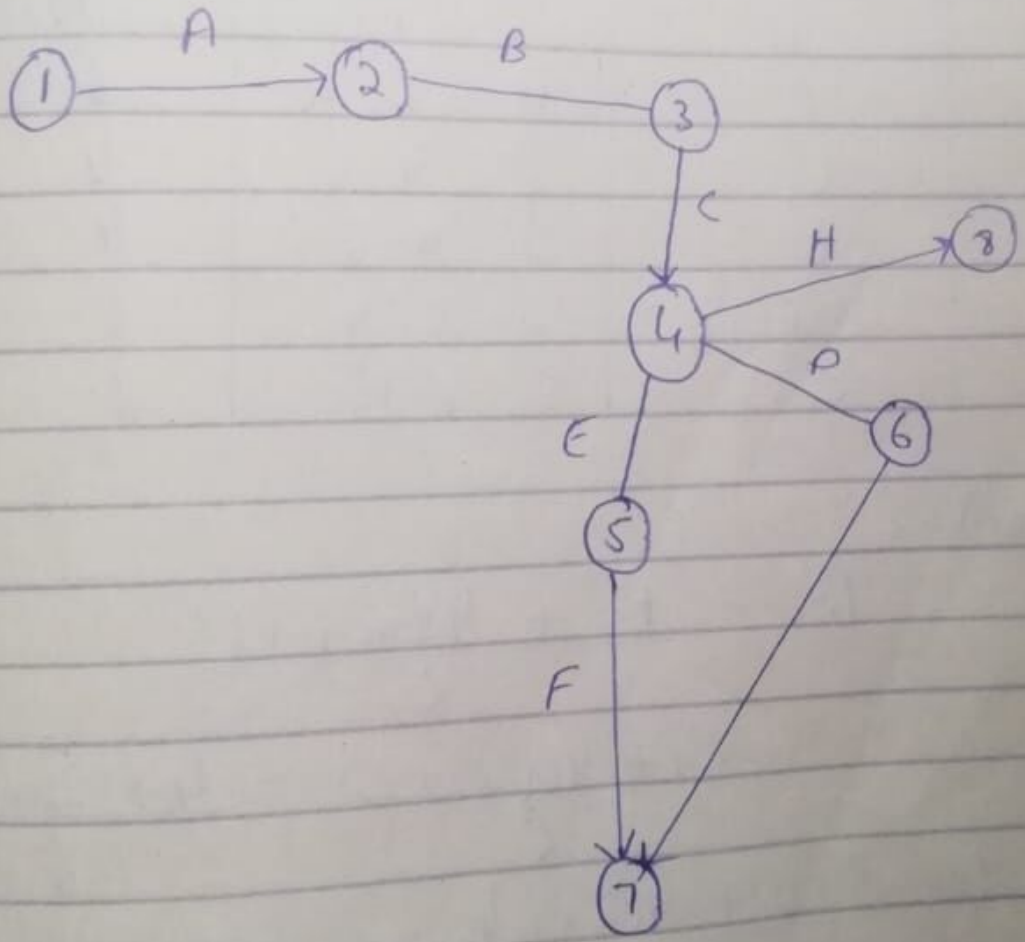
Part (c)



Question no '2' part (a)

Construct the Project network.

Solution :-



Question '2' part (b)

Activity	Predecessor	O.M.P	Most expected duration	Variance
A	–	4 5 10	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

formula:

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

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

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

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

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

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

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

$t_{e_1} = \frac{2 + 4(3) + 4}{6} = \frac{2 + 12 + 4}{6} = 3$

$t_{e_8} = \frac{5 + 4(7) + 15}{6} = \frac{5 + 29 + 15}{6} = 8$

Variance (σ^2):

formula

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

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

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

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

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

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

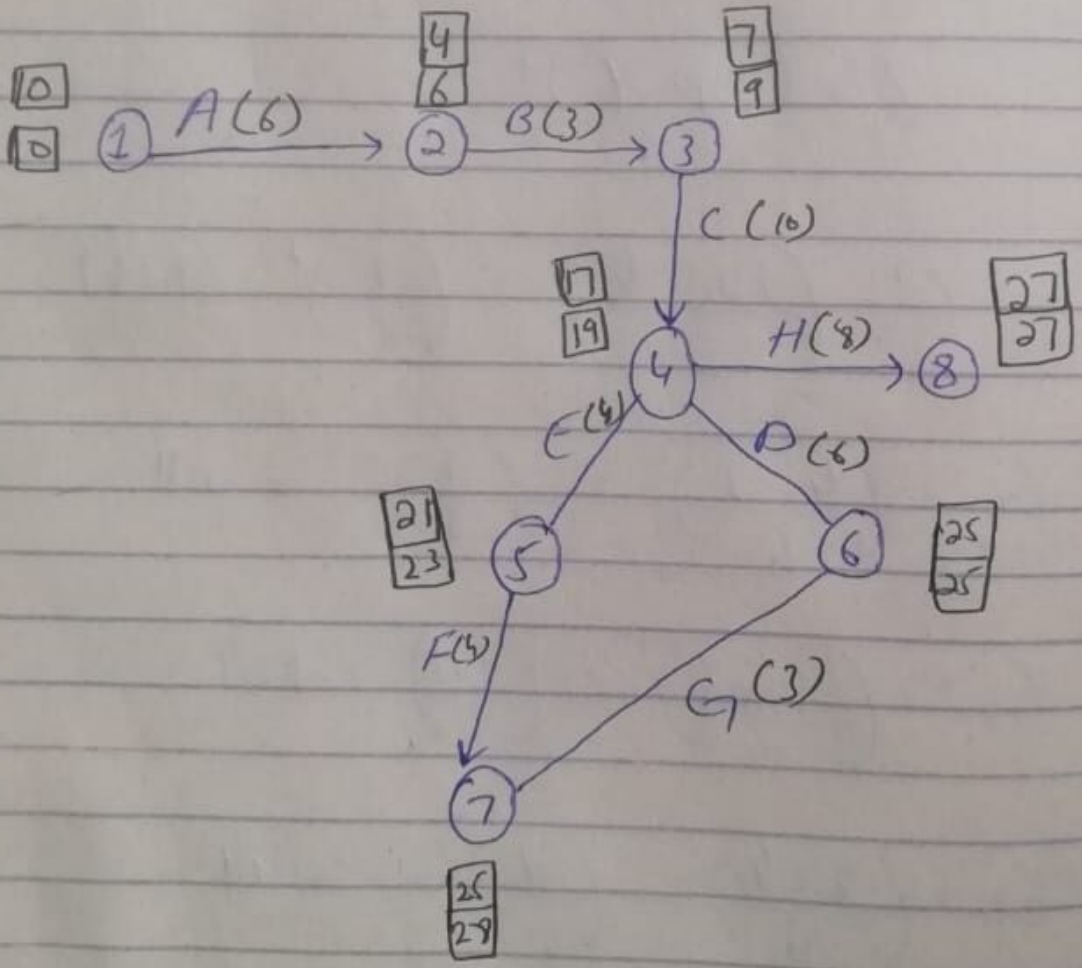
$$\sigma_6^2 = \left(\frac{6 - 2}{6}\right)^2 = \left(\frac{4}{6}\right)^2 = 0.44$$

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

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

Question '2' part 'c'

c, Find the critical path and expected project completion time.



Question no '3'

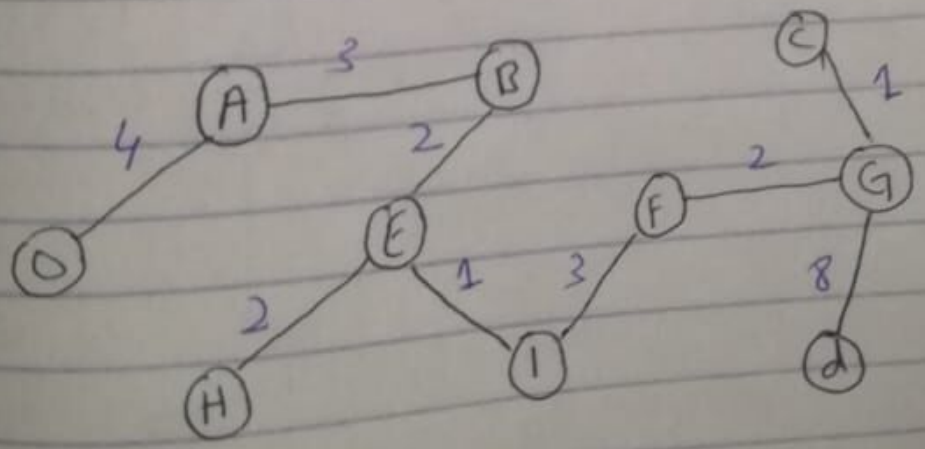
Ans:

In Prims algorithm the idea is simple to create a spanning tree with all sides connected by minimum weight. Also there should be no cycles.

Step '1'

Chose an orbitary start vertex.

Step ② keep including connected edges.



Question '4'

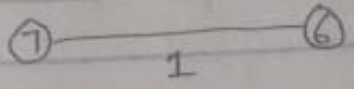
The graph contain 9 vertices and 14 edges. So, the minimum spanning tree formed will be having (9-1) = 8 edges

After sorting:

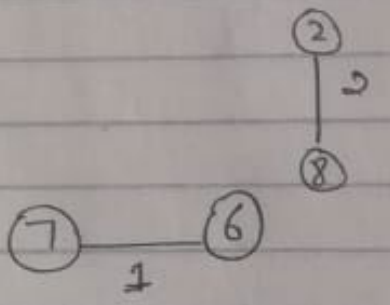
Weight	Src	Dest
1	7	6
2	8	2
2	6	5
4	0	1
4	2	5
6	8	6
7	2	3
7	7	8
8	0	7
8	1	2
9	3	4
10	5	4
11	1	7

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

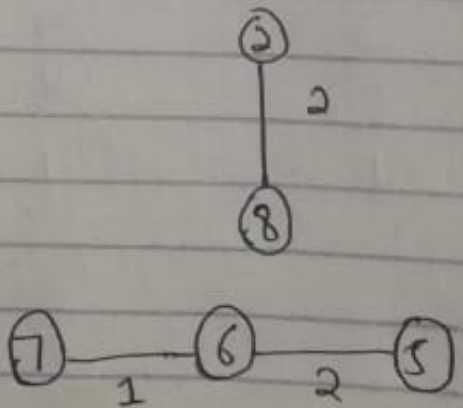
1) Pick edge 7-6: No cycle is formed, include it.



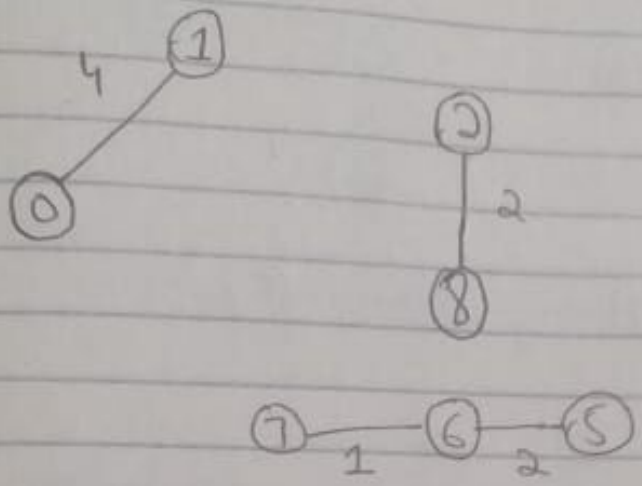
2) Pick edge 8-2: No cycle is formed, include it.



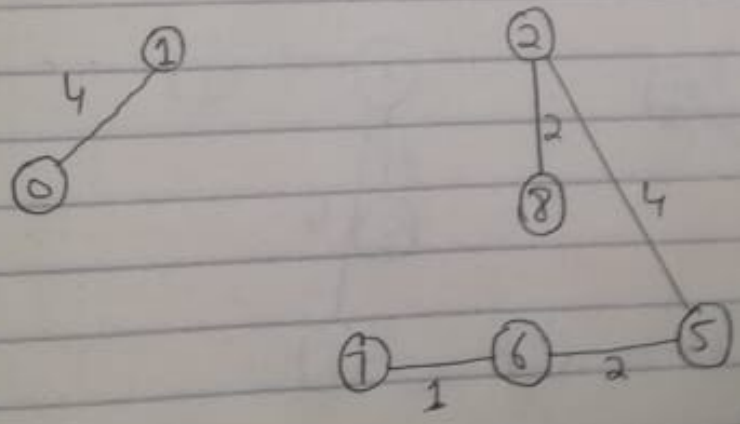
3) Pick edge 6-5: No cycle is formed, include it.



4) Pick edge 0-1: No cycle is formed, include it.

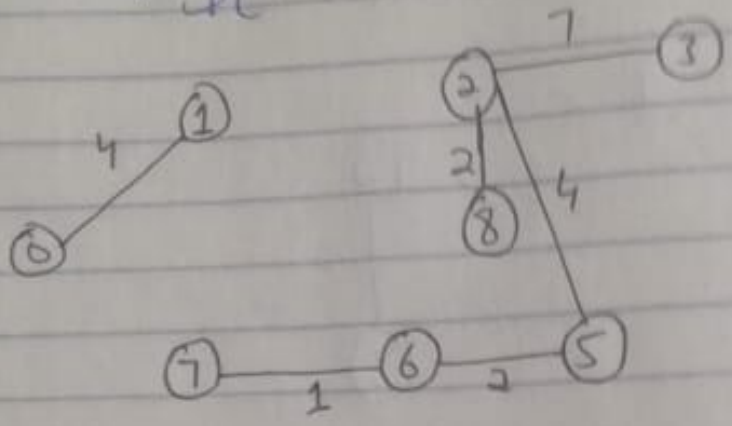


5) Pick edge 2-5: No cycle is formed, include it.



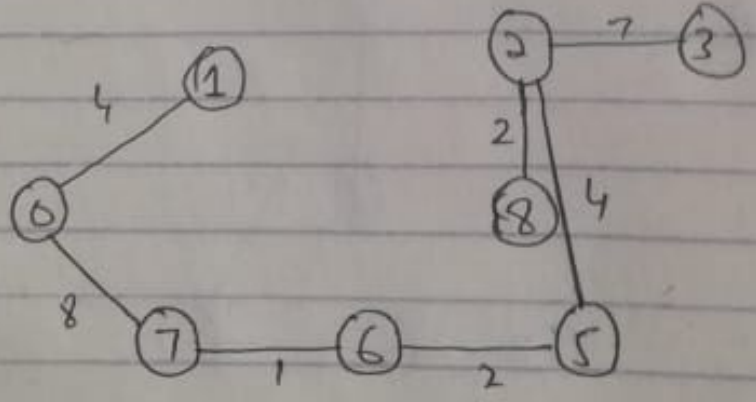
6) Pick edge 8-6: Since including this edge results in cycle, discard it

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



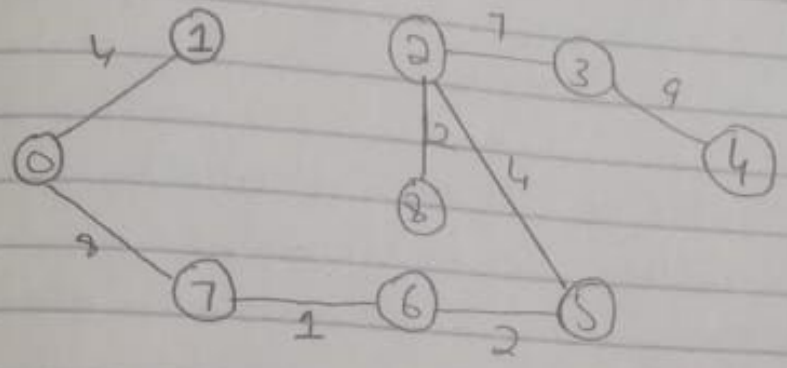
8) Pick edge 7-8: Since including this edge results in cycle, discard it.

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, in clude it.



Since the number of edges included equals (V-1), the algorithm stops here.

Question no '5'

Importance of Operation Research in Career:

- You have the opportunity to solve real-world problems. These problems matter to organization and have impact. you can truly change People's lives for the better.

- You can use your analytical skills and your creativity. Whether your background is math, Software engineering, compiler Scicne, or an industry such as health care, manufacturing, finance, goverment, or military, there is a job in O.R for you.

- You have mobility across industries and careers. You can apply your core O.R. skills to almost any industry. And with O.R training You can move into management consulting, operations, marketing, finance, or a number of other fields.

* You don't have to subscribe to a dominant worldview. O.R. has no single mode of professional practice, so you never have to get bored or pigeonholed into a specific technique or problem-solving approach that never changes.

* You become a better strategist. The O.R. discipline - looking at problems, creating models, and setting up analyses that points to better options and results - helps you make a better personal and professional decisions.

* You become an essential link between technology departments and organizational management. As an O.R. professional, you often act as interpreter between technical staff operators, operation managements, computer programmers, software engineers, and electrical engineers and managements.

* You can make a great living. The average starting salary for an O.R. professional is $60,000 to 70,000. and it's easy to move up to 100,000 dollars. In finance you can make upto $300,000 or more.