



The University of Jordan  
King Abdullah II School for Information Technology  
Information Technology Department  
Operations Research 1904341  
Second Semester 2020/2021  
Second Exam

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**Please note:**

- 1. Make sure to write your name and your student number.**
- 2. Time allowed is 50 minutes.**
- 3. You have to solve the two questions.**
- 4. The use of any type of application software to solve the exam questions is prohibited. Marks will be divided on the steps of your solution.**

**Q1) (13 points)** Petra company has decided to ask you to help them in solving their transportation problem. Petra company produces domestic product. This product is produced by three plants and then shipped to the company's distributing centers. The transportation costs per unit, distribution centers demand, and plants capacities are given below: -

Plant \ Center	C1	C2	C3	P/C
P1	12	10	6	600
P2	4	15	3	400
P3	9	7	5	300
P4	11	8	6	800
C/D	900	500	900	?

You are required to do the following:

1. Calculate the initial solution by using the Minimum Cost Method (MCM).

Plant \ Center	C1	C2	C3	P/C
Plant				
P1	12 400	10	6 200	600
P2	4	15 400	3	400
P3	9	7 300	5	300
P4	11 300	8 500	6	800
P5 DUMMY	0 200	0	0	200
C/D	900	500	900	2300

**initial COST : $400*12+200*6+400*3+300*5+300*11+500*8+200*0 = 16000$**

2. Find the optimal solution by using the Stepping Stone Method.

Plant \ Center	C1	C2	C3	P/C
Plant				
P1	12 400	10 +1	6 200	600
P2	4 -5	15 +9	3 400	400
P3	9 -2	7 -1	5 300	300
P4	11 300	8 500	6 +1	800
P5 DUMMY	0 200	0 +3	0 +6	200
C/D	900	500	900	2300

P1 C1 = 400, P1 C3 = 200,



Plant \ Center	C1	C2	C3	P/C
P1	12 +2	10 +3	6	600
P2	4 400	15 +14	3 +3	400
P3	9 D(0)	7 +1	5	300
P4	11 300	8 500	6 -1	800
P5 DUMMY	0 200	0 +3	0 +4	200
C/D	900	500	900	2300

1- MODIFIDE COST

$$600*6 + 400*4 + 300*5 + 300*11 + 500*8 + 200*0 = 14000 \text{ JDS}$$

Plant \ Center	C1	C2	C3	P/C
P1	12 +1	10 +2	6	600
P2	4 400	15 +14	3 +4	400
P3	9 300	7 +1	5 +1	300
P4	11 D(0)	8 500	6 300	800
P5 DUMMY	0 200	0 +3	0 +5	200
C/D	900	500	900	2300

2- MODIFIDE COST = 13700

optimal COST = 13700



3. Compare, in specific way, the initial Distribution with the optimal distribution and make meaningful comment.

OPTIMAL

P1 C3 =600

P2 C1=400

P3 C1=300

P4 C1=200

THE TOTAL COST IS 13700

WE REDUCE IT FROM 16000 JDS FROM THE INITIAL DISTRIBUTION



**Q2) (12 points)** A Job Shop needs to assign 4 jobs to 4 workers. The cost of performing a job is a function of the skills of the workers. The following table summarizes the cost of the assignments. Worker 1 cannot do job 3, and worker 3 cannot do job 4.

Job Worker \	J1	J2	J3	J4
W1	50	50	N	20
W2	70	40	20	30
W3	90	30	50	N
W4	70	20	60	70

1- You are required to make the optimal allocation for those workers.

Job Worker \	J1	J2	J3	J4
W1	0	30	N	0
W2	20	20	0	10
W3	30	0	20	N
W4	20	0	40	50

Job Worker \	J1	J2	J3	J4
W1	0	40	N	0
W2	10	20	0	0
W3	20	0	20	N
W4	10	0	40	40

FINAL ASSIGNMENT

W1 => J1 = 50

W2 => J3 = 20

W3 => J2 = 30



W4 => J4 = 70

**2-** Calculate the total reduction involved in achieving the optimal solution.

**total reduction=50+20+30+70=170 JDS**

