Northern Border University **Faculty of Engineering** **IE Department**		**IE 453 Facilities Planning** **Final Exam Dr. Mohamed Mostafa** **Date: 12/03/1436 Time Allowed: 2 Hrs**

Solve Problem 1, AND Problem 2 OR 3, AND Problem 4 OR 5

Problem # 1 (10 Points)

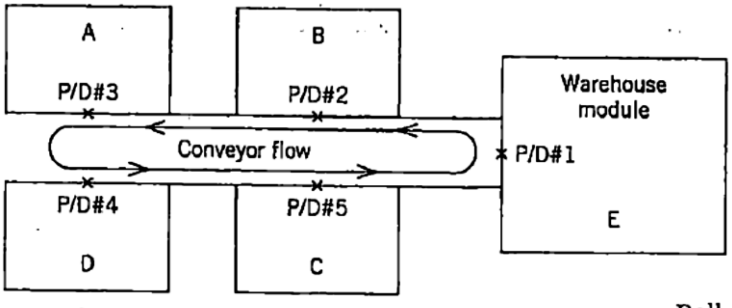
XYZ Inc. has a facility with six departments (A. B, C, D, E, and F). A-summary of the processing sequence for 10 products and the weekly production forecasts for the products are given in the table below.

Develop the from-to chart based on the expected weekly production.

Product	Processing Sequence	Weekly Production
1	ABCDEF	960
2	ABCBEDCF	1200
3	ABCDEF	720
4	ABCEBCF	2400
5	ACEF	1800
6	ABCDEF	480
7	ABDECBF	2400
8	ABDECBF	3000
9	ABCDF	960
10	ABDEF	1200

Problem # 2 (20 Points)

In an assembly plant, material handling between departments is performed using a unidirectional closed-loop conveyor. The figure below shows the layout for the modular facility, which consists of three equal-sized assembly modules (A, B, and C), one administrative module (D), and one warehouse module (E). P/D points for each module are also shown in the figure. The administrative and warehouse activities are not to be moved; however, assembly areas A, B, C can be relocated. The distance between P/D points and the number of pallet loads moved between departments are given below.



P/D Pickup/Delivery stations

Distance between P/Ds

From	To	Distance
P/D 1	P/D 2	60′
P/D 2	P/D 3	90′
P/D 3	P/D 4	30′
P/D 4	P/D 5	90′
P/D 5	P/D 1	60′

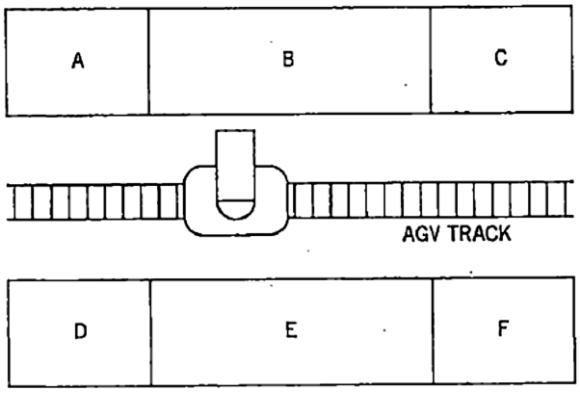
Pallet Flow per Day

From/To	A	B	C	D	E
A	0	0	5	0	30
B	10	0	25	0	0
C	25	5	0	0	0
D	0	0	0	0	0
E	5	20	5	0	0

Using the pairwise exchange method, determine new locations for assembly modules A, B, and C that minimize the sum of the products of pallet flows and conveyor travel distances.

Problem # 3 (20 Points)

Amobile robot is serving two cells located at either sides of the AGV track, as shown by the figure below. There are three machines placed in each cell. Given the from-to chart in the table below, find the best machine arrangements for both cells. Rearrangement is limited only to machines within each cell. Assume that the P/D point of each machine is located at the midpoint of the machine edge along the AGV track.



M/C	A	B	C	D	E	F
A	—	10	50	30	0	60
B	5	—	45	40	30	0
C	40	30	—	35	5	20
D	40	25	50	—	40	50
E	0	55	40	50	—	0
F	20	0	60	20	10	—

M/C	Distance	M/C	Distance
A-B	30	D-E	30
A-C	60	D-F	60
B-C	30	E-F	30

Problem # 4 (10 Points)

Let four existing facilities be located at P1 = (0, 10), P2 = (5, 10), P3 = (5, 15), and P4 = (10, 5) with W1 = 15, W2= 20, W3= 5, and W4 = 30.

a. Determine the optimum location for a single new facility when cost is proportional to **rectilinear** distance.
b. Rank the alternative locations in order of preference

Possible locations for the new facility are shown in the table below:

Facility	x-Coordinate	y-Coordinate
1	10	10
2	10	15
3	15	18

Problem # 5 (10 Points)

The Ashley County News Observer plans to rent building space for a new print shop within the city limits. The locations for current distribution centers, expected deliveries, and possible locations for the facility are shown in the tables and figures below.

a. Determine the optimal location for the new print shop.
b. Rank the alternative locations in order of preference

Current distribution centers:

Center	x-Coordinate	y-Coordinate	Weight
A	5	10	200
B	50	15	400
C	25	25	500
D	35	5	300

Possible locations for the new print shop:

Building	x-Coordinate	y-Coordinate
1	20	20
2	40	25
3	25	35