INDUSTRIAL FACILITY DESIGN

CHAPTER 10

QUANTITATIVE FACILITIES PLANNING MODELS

GROUP 9:

SHAHROZ AZHAR 11-IE-18

JUNAID HASSAN 11-IE-36.

SUMMYIA QAMAR 11-IE-46

SUBMITTED TO:

DR. HARIS AZIZ.

Question 10.9 (b)

Determine minimum location assuming new facility cannot be located within a housing sector.

HOUSING SETOR	WEIGHT	INTERSECTION	WEIGHT
A_1	10	P_1	30
A_2	15	P_2	15
A_3	20	P_3	5
A_4	30		

EUCLIDEAN DISTANCE:

$$\because \text{Min. } (f(x,y) = \Sigma w_i [(x-a)^2 + (y-b)^2]^{1/2}$$

∵ the facility can not be located within a housing sector therefore we consider the intersection points

P_1, P_2, P_3.

XY CO-ORDINATES:

$P_1 : (4, 6)$

$P_2 : (10, 10)$

$P_3 : (14, 2)$

X - CO-ORDINATES:

EXISTING FACILITY	x- COORDINATE a_i	WEIGHT
P_1	4	30
P_2	10	15
P_3	14	5

Y- COORDINATES:

EXISTING FACILITY	Y- COORDINATE b_i	WEIGHT
P_3	2	5
P_1	6	30
P_2	10	15

$$\therefore x^* = \sum_{i=1}^{3} (w_i \times a_i / w_i)$$

$$= (4 \times 30) + (10 \times 15) + (14 \times 5) / 30+15+5$$

$$= 390/50 = 7.8$$

$$Y^* = \sum_{i=1}^{3} (w_i \times b_i)/w_i$$

$$= (2 \times 5) + (6 \times 30) + (10 \times 15) / 30+15+5.$$

$$= 340/50. = 6.8.$$

∴ OPTIMUM LOCATION FOR NEW FACILITY = (x^*, y^*)

$$= (7.8, 6.8)$$

Now the minimum distance will be:

$$\min f(x, y) = \Sigma w_i [(x - a_i)^2 + (y - b_i)^2]$$

$$= 30 [(7.8-4)^2 + (6.8-6)^2] + 15[(7.8-10)^2 + (6.8-10)^2] + 5 [(7.8-14)^2 + (6.8-2)^2].$$

$= 30\left[(14.44)+(0.64)\right] + 15\left[(4.84)+(10-24)\right]$

$+ 5\left[38.44 + 23.04\right]$

$= 452.4 + 226.2 + 307.4 = \mathbf{986}.$

$f(7.8, 6.8) = 986.$

$\Rightarrow$ The new facility (emergency response unit) is located at (7.8, 6.8) and doesn't located within the housing sector.