

W 2614

M.E. DEGREE EXAMINATION, JANUARY 2007

First Semester

Industrial Engineering

IE 1604 — FACILITIES LOCATION AND DESIGN

(Regulation 2005)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

How does the location decision for service facilities differ from that for manufacturing facilities?

Formulate single facility location problem.

Differentiate product layout from process layout.

Distinguish between Construction Algorithm and Improvement Algorithm.

List the advantages of Group Technology.

A line balancing problem involves 10 work stations having $\sum t = 24$ minutes. (shortest time is 2.1 min., longest time is 3.0 min.). Assuming only one worker is located at each station and using longest time as CT, what would be the balance efficiency?

Write a short note on Unit load concept.

State the factors to be considered while selecting packaging material.

List the principles for successful warehouse operations.

10. What is Cross Docking in Warehousing? Why it is necessary?

PART B — (5 × 16 = 80 marks)

11. (a) Explain the ways of measuring and benchmarking the warehouse performance. (8 + 8)

Or

(b) (i) What are the key factors that an industry would consider in locating a warehouse? (6)

(ii) Discuss the important considerations involved in the design of warehouse layout? (10)

12. (a) The operations manager of Oil Company has narrowed the search for a new facility location to seven location. Annual fixed costs and variable costs are given below.

Location	Fixed costs/year (in Rupees)	Variable costs/barrel (in Rupees)
Aurora	16,00,000	17.00
Boulder	20,00,000	12.00
Colorado	15,00,000	16.00
Denver	30,00,000	10.00
Eaglewood	18,00,000	15.00
Fort Collins	12,00,000	15.00
Golden	17,00,000	14.00

- (i) Which of the location can be eliminated from the further consideration because they are dominated (both variable and fixed costs are higher) by another location? (6)
- (ii) Plot the total cost curves for all remaining location on a single graph. Identify on the graph the appropriate range over which each location provide the lowest cost. (6)
- (iii) Using break - even analysis, calculate the break-even quantities to determine the range over which each company provides the lowest cost. (4)

Or

- (b) Three existing facilities are located at $P_1 = (3,4)$, $P_2 = (8,7)$ and $P_3 = (15,2)$. Two new facilities are to be located with respect to the existing machines. The cost data for the location problem are

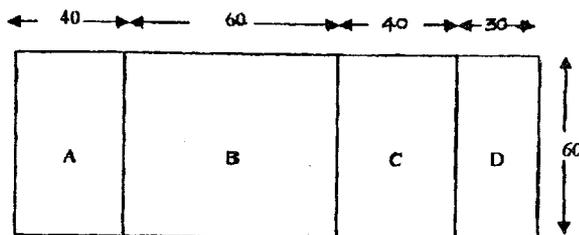
$$V_{12} = 3$$

$$W = \begin{pmatrix} 2 & 6 & 0 \\ 4 & 5 & 1 \end{pmatrix}$$

Determine the optimum locations for the new facilities assuming cost is proportional to (i) Rectilinear distance (ii) Squared Euclidean distance.

(8 + 8)

13. (a) Follow the steps of CRAFT algorithm and develop a final layout using CRAFT pair wise interchange technique. The initial layout, cost data and flow data are given :



Initial layout

	To	A	B	C	D
From					
A		-	3	4	0
B		2	-	0	4
C		2	0	-	0
D		0	2	0	-

Cost data

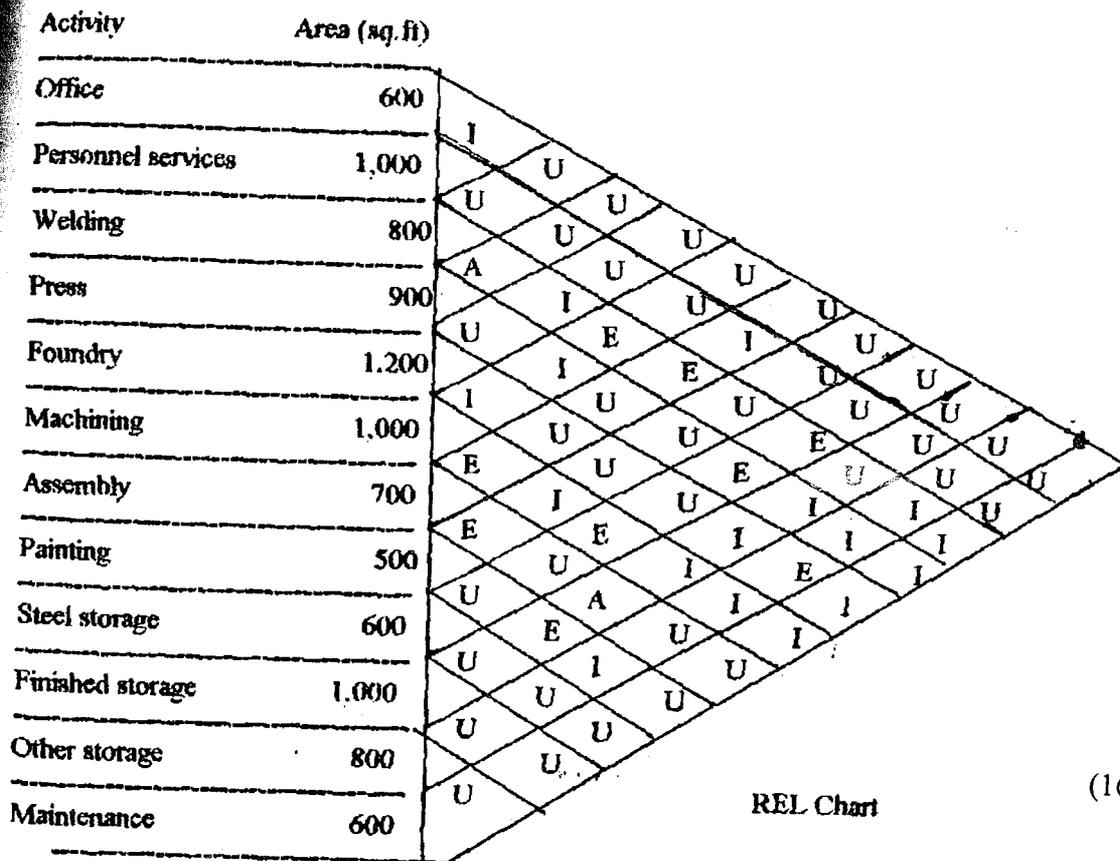
	To	A	B	C	D
From					
A		-	1	2	1
B		1	-	1	2
C		2	1	-	1
D		1	2	1	-

Flow data

(16)

Or

- (b) The Ammu Job shop has requested that a new layout be designed for their operation in Karur, Tamilnadu. There are 12 departments involved. The department areas (in square feet) and activity relationships for the job shops are given below : Design a block layout using ALDEP algorithm.



(16)

14. (a) The machine component incidence matrix is given below : Follow the steps ROC - 2 algorithm and find out the machine cells.

Machine	Component						
	1	2	3	4	5	6	7
A	0	1	0	1	1	1	0
B	1	0	1	0	0	0	0
C	1	0	1	0	0	0	1
D	0	1	0	1	0	1	0
E	1	0	0	0	0	0	1

(16)

Or

- (b) The Alpha shoes Exporter produces 70 pairs of shoes per hour on its production line. The Operations involved in the production process are listed below along with the sequencing requirements.

Task	Immediate Predecessor	Estimated time (Sec).
A. Cut the soles	—	20
B. Cut one upper	—	10
C. Cut the other upper	—	15
D. Drill the uppers	B,C	10
E. Sew the uppers	D	10
F. Press the uppers	E	25
G. Shape the uppers	F	15
H. Join and press	A,G	30
I. Sew the soles	H	20
J. Finish	I	25

Balance the line for the given production rate using

- (i) Largest candidate method (7)
 - (ii) Ranked Positional Weight method (7)
 - (iii) What is the balance Delay? (2)
15. (a) Explain the complete procedure for the selection and specification of material handling equipment with suitable example. (16)

Or

- (b) Explain the various types of basic material handling equipments used in production plant and specify its important functions. (16)