NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF INDUSTRIAL TECHNOLOGY

DEPARTMENT OF INDUSTRIAL ENGINEERING

Bachelor of Engineering in Industrial and Manufacturing

PART III - MANUFACTURING SYSTEMS - TIE 3112

SUPPLEMENTARY EXAMINATIONS OCTOBER 2009

Time allowed: 3 hours

Instructions to students

1. Answer Any Five (5) questions

Q1 a) Discuss flowline systems in terms of two major aspects business implications of process choice. [10]

b) Briefly describe hybrid manufacturing systems. [10]

Q2 a) Describe briefly three objectives of a good stimulate facility layout. [6]

b) Discuss two methods of transportation in automated flowline systems? [4]

c) Applying Ranked Positional Weight method design an assembly line given that cycle time is 40 time units using data given in Table 2.1. [10]

Table 2.1

Operation	Time	Immediate Predecessors
A	3	-
B	5	-
C	10	A, B
D	11	C
E	24	C
F	26	D
G	24	E
H	15	G

Q3 WXYZ company management wants to arrange six departments of it factory in a way that will minimize interdepartmental material handling costs. They make an intial assumption that each department is 20x20m and that the building is 60 m long and 40 m wide. Given a from –to matrix shown in Table 3.1.

a) Using flow information design the first layout possible to minimize cost [10]

b) Determine the cost of this layout. [10]

Table 3.1

	1	2	3	4	5	6
1	-	50	100	0	0	20
2		-	30	50	10	0
3			-	20	0	100
4				-	50	0
5					-	0
6						-

Q4 a) A five-station transfer line is being considered. All failures are expected to occur at workstations and be operation dependent. Average repair time will be 5 cycles for each station. Average failure rates are estimated to be 0.01, 0.02, 0.02, 0.03 and 0.02 respectively

i) Find the line availability, assuming no buffer [8]

ii) Suppose one buffer of size 10 is to be added. Where should it be placed? [2]

iii) Compute the effectiveness of the line with the buffer included. [10]

$$x_i = \frac{\alpha_i}{b_i}$$

$$s = \frac{x_2}{x_1} \qquad r = \frac{\alpha_2}{\alpha_1} \qquad \text{and C} = \frac{(\alpha_1+\alpha_2)(b_1+b_2)-\alpha_1 b_2(\alpha_1+\alpha_2+b_1+b_2)}{(\alpha_1+\alpha_2)(b_1+b_2)-\alpha_2 b_1(\alpha_1+\alpha_2+b_1+b_2)}$$

$$E_z = \frac{1-sC^z}{1+x_1-(1+x_2)sC^z} \qquad \text{when } s \neq 1$$

$$\text{or } E_z = \frac{1+r-b_2(1+x)+Zb_2(1+x)}{(1+2x)[1+r-b_2(1+x)]+Zb_2(1+x)^2} \qquad \text{when } s = 1$$

Q 5 a) Discuss five methods of comparing facility layout in a factory. [10]

b) Briefly explain five factors that one would use in the choosing of method of transfer of parts. [10]

Q6 a) Briefly explain two mode of failure. [4]

b) Three models A, B&C of a particular product are assembled concurrently on an assembly line. The quantities required over a given period and the model cycle times are as shown in Table 6.1.

Table 6.1

Model	**No of unitsRequired**	**Model cycle time**

j	N	Cj
A	6	0.5
B	11	0.6
C	5	0.8

Calculate the fixed interval at which units must be launched onto the line, and show how the sequence of models might be determined in order to avoid station idle time: [8]

c) How would you sequence the batches shown in Table 6.2. [8]

Table 6.2

Cost	**Succeeding Model**			
	A	B	C	D
A	0	10	15	8
B	5	0	10	7
C	8	4	0	11
D	12	10	6	0