National Exams May 2018

16-Mec-B4, Integrated Manufacturing Systems

3 hours duration

Notes:

1. If doubt exists as to the interpretation of any question, the candidate is urged to submit with the answer paper, a clear statement of any assumptions made.

2. This is an OPEN BOOK exam. Any non-communicating calculator is permitted.

    Five (5) questions constitute a complete paper. There are only five (5) questions.

3. All questions are of equal value.

4. Some questions require an answer in essay format. Clarity and organization of the answer are important.

Question 1:

a) What are the three basic controllable variables of a production planning problem? What are the four major costs?

b) Distinguish between pure and mixed strategies in production planning?

c) How does Search Decision Rule method work?

d) What are the general conditions for which preventive maintenance is appropriate?

Question 2:

A small service organization has four departments arranged as shown in the figure below, on the left, with interdepartment distances based on the center of departments A, B, C and D.   The number of trips between departments during a typical week is given on the right. The department sizes are appropriate, and the cost of a trip is primarily a function of distance. What do you think of the present layout? Would you suggest any changes?

20'	
A	B	10'
C	D	
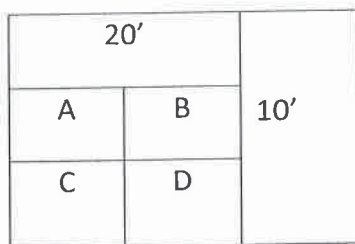
	A	B	C	D
A	-	25	15	20
B		-	20	10
C			-	5
D				-

Question 3:

Develop an inventory control system for a new product just starting production when the following information is given:

a) Production economic lot size is 1000 units.

b) Production rate (supplied daily to inventory) is 50 units per day.

c) Usage rate is 20 units per day.

d) Production start up takes 10± 5 days after an order is placed.

e) Annual cost of storing 1 unit is $5.00

f) Production cost of product is $15.00

g) 240 production and sales days per year.

Question 4:

a) Control charts are maintained on the weight of an item. After a base period of 30 samples of size 3, $\Sigma X = 12930$ g and $\Sigma R = 123$ g.

- Compute the control limits and estimate the standard deviation of the item weights. (Assume that base period observations indicate the process to be in control.)
- If the process average of the weights shifts to 433 g, how long will it take to detect the shift using the control limits in part (a)?

b) Production is started to produce a newly designed component. To monitor the length, X and R charts are started based on 25 subgroups of four items each. For these 25 subgroups, $\Sigma X = 500$ cm and $\Sigma R = 153.2$ cm. Determine the 3σ control limits. What is the probability that a shift of 2 cm in the process would be detected on the first subgroup observed after the shift?

Question 5:

a) What are some of the objectives of materials handling?

b) What should an effective inventory control system accomplish? What vital areas should be considered in developing a comprehensive control system?

c) List some factors which influence the selection of a forecasting model.