GX583

NATIONAL UNIVERSITY OF IRELAND, GALWAY

SUMMER EXAMINATION 1999

Final Year Examination

B.E. INDUSTRIAL ENGINEERING AND INFORMATION SYSTEMS

Computer Integrated Manufacturing

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Time allowed : 3 hours

Answer Questions 1 and 2 in Section A and one Question each from Sections B & C.

SECTION A

1 **(a)** Beta Ltd., manufactures two products, Product A and Product B. The bills of material for the two products are illustrated in Figure 1 below.

Given the master schedule shown in Table 1 below, calculate the requirements for components C01 and C02. The inventory position is illustrated in Table 2 and the lead-time data is presented in Table 3. Open orders data is presented in Table 4. Finally, you may assume that you are working in week number 5.

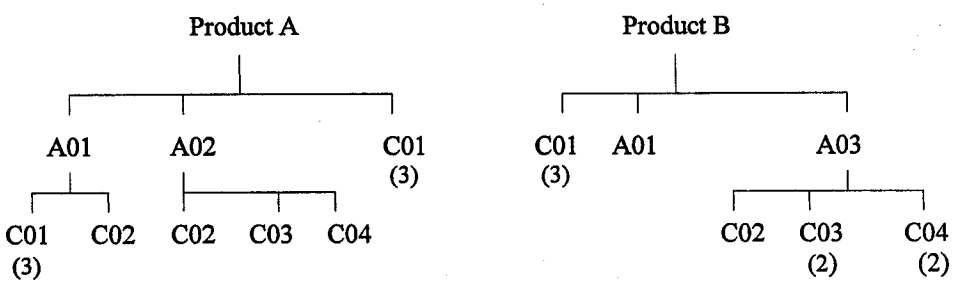

Figure 1 ~ BOMs for Product A and Product B.

Week No.	10	11	12	13	14	15	16	17
Product A	-	50	50	50	60	60	-	-
Product B	-	100	100	90	100	110	-	-

Table 1 ~ Master Schedule

Item	*On Hand*	*Committed*
A01	200	100
A02	200	50
C01	400	200
C02	300	200
C03	600	300

Table 2 ~ Inventory Position

Item	*Lead Time*
Product A	1 Week
Product B	1 Week
A01	1 Week
A02	2 Weeks
A03	1 Week
C01	1 Week
C02	1 Week
C03	2 Weeks
C04	1 Week

Table 3 - Lead Time Data

Item	Scheduled Receipt	Due Date
A01	100	10
A02	50	10
A03	50	10

Table 4 - Open Orders

(b) Beta Ltd., is concerned about the reliability of the supplier of Component C01, and is considering developing a safety stock policy to deal with this concern. What would you advise? Which items in the BOMs should be supported with safety stocks? What levels of safety stock are appropriate?

2. DEI Ltd. wishes to select an appropriate lot sizing algorithm to use in its MRP system. A typical manufacturing part can be described as follows:

Set up Cost: £75
Inventory carrying cost: £0.25 per unit per week

The demand forecast per week over the next 10 weeks is as indicated below. Further, we may assume a starting inventory of zero.

Week No.	1	2	3	4	5	6	7	8	9	10
Demand	200	300	250	480	200	260	150	320	250	310

DEI Ltd., have decided to limit their options to the Economic Order Quantity (EOQ) model, the Periodic Order Quantity (POQ) model, and the part period balancing procedure. Assuming that the demand patterns and the costs given above are representative, which policy would you advise? Why?

SECTION B

3. *Attempt **five** of the following sections:*

(i) Distinguish clearly between regenative and net charge MRP system.

(ii) Distinguish clearly between bucketed and bucketless MRP system.

(iii) How is pegging used to support bottom up replaning in MRP system?

(iv) How does capacity requirements planning (CRP) support MRP?

(v) What do you understand by the term RCCP (Rough Cut Capacity Planning)?

(vi) Distinguish clearly between forward scheduling and backward scheduling.

4. *Attempt five of the following sections:*

(i) If set up times and costs approach zero, then the ultimate small batch, namely the batch size of one is economic. Why?

(ii) Distinguish clearly between mixed-model production and multi-model production.

(iii) What do you understand by the term "internal set up"? What is the significance of the difference between internal set-up and external set-up?

(iv) Differentiate clearly between the transfer lot and the process lot and show how the use of transfer lots reduces production lead-time.

(v) Define repetitive manufacturing and position it within a volume and variety typology of manufacturing systems.

(vi) What do you understand by the term "production smoothing"?

SECTION C

5. (a) Sketch the blending functions for the defining points and vectors of a parametric cubic curve.

(b) Calculate the co-efficient for the function $x = x(u)$, $y = y(u)$ for a Hermite interpolation parametric cubic curve through the points $P_1 = (1,3)$ and $P_2 = (5,5)$ with the start and end tangent vectors $P'_1 = (1,2)$ and $P_2' = (1,0)$. Sketch the curve and the tangent vectors.

(c) Calculate the parametric mid-point of the Hermite cubic curve of 5(b) above.

Note: The general form of a cubic curve in the Hermite basis is:

$$P(U)^2 = P_1(1-3U^2+2U^3) + P_2(3U^2-2U^3)$$
$$+ P'_1(U - 2U^2 + U^3) + P2'(-U^2 + U^3)$$

6. (a) Explain the basis of Bezier curves and why they are used in place of the Hermite model.

(b) Consider the following two dimensional case and sketch a Bezier curve with control points (0,0), (12,3) and (8,7). Assume increments of 0.1

(c) Calculate the co-ordinates of the parametric mid-point of the Bezier curve of 6 (b).

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