

NATIONAL UNIVERSITY OF IRELAND, GALWAY

SUMMER EXAMINATION 2000

Final Year Examination

B.E. INDUSTRIAL ENGINEERING AND INFORMATION SYSTEMS

Computer Integrated Manufacturing

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Time allowed : 3 hours

Answer Question 1 and one other question in Section A and Question 4 and one other question in Sections B.

SECTION AObligatory Question

1. Galway Manufacturing Ltd manufactures two products, Product X and Product Y. The bills of material for the two products are as illustrated in Figure 1 below.

A01 refers to an assembly composed of two components, C02 and C03. Note that there are common components between the two products (e.g. C01) and also assembly A01 is common to the two products. The number in brackets under a component indicates the number of that component required to build the assembly or product. Thus, three of item C02 are required to assemble item A01.

Given the short master schedule outlined below, calculate the net requirements for components C01 and C02. Assume no inventory and no outstanding orders.

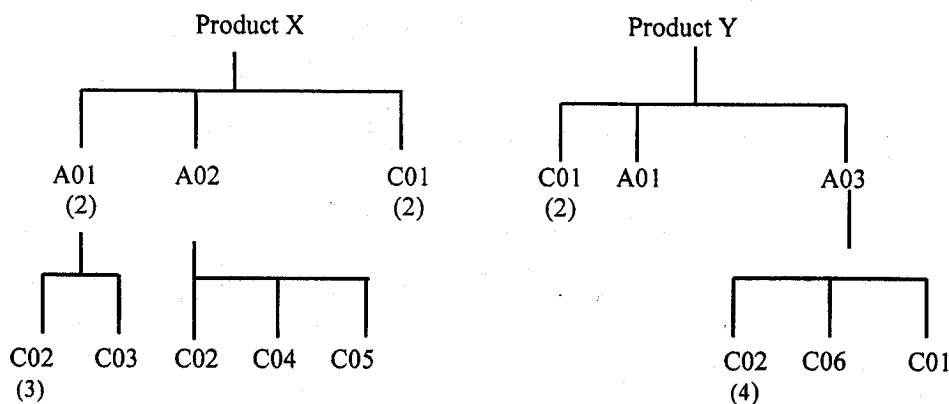


Figure 1 ~ Bills of material for Products X and Y

Week No.	10	11	12	13	14	15	16	17	18	19	20
Product X				60		100	90	100			
Product Y				200		100	50	120			

Table 1 ~ Master Schedule

<i>Item</i>	<i>Lead time</i>	<i>Item</i>	<i>Lead time</i>
X	1	C02	1
Y	1	C03	1
A01	1	C04	1
A02	1	C05	1
A03	1	C06	1
C01	1	C07	1

Table 2 ~ Lead Time Data

2. Answer **five** of the following six questions:

- (i) What is "flow-based manufacturing"?
- (ii) Explain JIT purchasing.
- (iii) How does the JIT approach to manufacturing deal with the relationship between product and process variety?
- (iv) What is production smoothing?
- (v) How does mixed model production facilitate unexpected changes in the planned schedule?
- (vi) What approaches are available to reduce queueing time?

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

- (a) Why is "pegging" necessary in MRP systems? How does "single level pegging" differ from "full pegging"?
- (b) Distinguish clearly between net change and regenerative MRP systems.
- (c) Differentiate clearly the respective roles of the scheduler and the dispatcher in a PAC system.
- (d) Rule 5 of OPT says that "Bottlenecks govern both throughput and inventory in a system". Explain.
- (e) Why does OPT argue that "the transfer batch may not, and many times should not, be equal to the process batch".
- (f) How does the monitor support the scheduler and dispatcher in a PAC system?

SECTION B

Obligatory Question

4.

- (a) Distinguish clearly between models of the design process and models of design.
- (b) Using a simplified model of the design process, indicate where computational aids might be of value to the designer. In your answer, make reference to a CAD system with which you are familiar.
- (c) What are the differences between the sequential approach to product development and the concurrent engineering approach? Why is concurrent engineering preferred?

5.

- (a) Why is parametric representation popular in computational geometry?
- (b) Calculate the coefficients for the function $x = x(u)$, $y = y(u)$ for a Hermite interpolation parametric cubic curve through the points:

$$p_1 = (1, 2)$$

$$p_2 = (5, 6)$$

with the start and end tangent vectors:

$$p'_1 = (1, 1)$$

$$p'_2 = (1, 0)$$

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

6.

- (a) Distinguish clearly between "simple" and "hierarchical" group technology coding systems. Use an example from the Opitz system to illustrate your answer.
- (b) In terms of design for assembly, outline some appropriate guidelines for:
1. The simplification and standardization of product design.
 2. Facilitation of the assembly process.
- (c) Distinguish clearly between "variant" and "generative" process planning.

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