

THE UNIVERSITY OF ADELAIDE
DEPARTMENT OF MECHANICAL ENGINEERING

EXAMINATION FOR THE DEGREE OF BACHELOR OF
ENGINEERING

NOVEMBER 2002

MANUFACTURING ENGINEERING 2 (7915)

Time: Two (2) Hours and Ten (10) Minutes

Information for Candidates

Candidates are encouraged to spend the first ten (10) minutes reading the exam paper
Marks for all questions are as indicated and total marks are out of 100.

The use of reference material is permitted.

Candidates should ensure that all work must bear the student's name and be attached or
included in the examination booklet

**Section One is compulsory and three (3) of the four (4) questions from Section Two
must be attempted**

Section One (40 Marks)

Question 1

Using a few sentences and diagrams as necessary, answer the following parts. All parts
carry the same marks. (4 marks each) Suggested time 40 minutes

- (a) What is Group Technology (cellular manufacture) and what advantages does it
offer to batch type operations?
- (b) What is the difference between push and pull systems of manufacturing, what type
of manufacturing approach is applied to each and what market requirement would
each satisfy?

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- (c) Identify the different forms of the Master Production Schedule and explain why these different forms are used?
 - (d) Clearly explain how you would monitor the accuracy of a forecasting model.
 - (e) Why is the relationship with suppliers so important to the successful working of JIT?
 - (f) With a neat diagram explain the workings of MRP module and its relationship with BOM and Inventory files.
 - (g) What is meant by the term Level Scheduling as applied to Aggregate or Production Planning and what advantages does it have to offer over other methods?
 - (h) Explain the use of the Two Bin System as used as a form of inventory control and its similarities with a Kanban System.
 - (i) Why is it necessary for the operations function to have a strategy in its own right and what should that strategy be linked to?
 - (j) Why is JIT manufacturing now frequently referred to as lean manufacturing?
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Section Two. (60 Marks)

Answer three (3) questions. Each question is worth 20 marks Suggested Time One Hour Twenty Minutes

Question 1

Currently, the Cambridge Plastics Company sells industrial packaging materials to two different market segments:

- Injection-molded plastic bottles sold to soft-drink bottlers in very high volume with significant seasonal variations in sales. The customers provide call-off schedules indicating their product requirements over the next six months, specifying the delivery quantities each week. Key factors in winning this business are the ability to meet large changes in the weekly quantities and the ability to provide a major capacity increase for the increased demand during the peak summer selling season.

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- Custom-molded plastic bottles sold in wide variety and low volume to manufacturers of cosmetic, pharmaceutical, and agricultural chemical products. These are produced to specific customer orders, with the key factors in winning orders in this business being competitive prices and delivery reliability.

The original plant was set-up to produce high volume, low cost product with dedicated high volume processes and equipment monitored by a rate based manufacturing planning and control system. This was not changed with the introduction of the low volume wide variety products.

- Identify the problems that Cambridge Plastics might experience in competing in these two very different markets when linking its existing manufacturing capacity and planning and control systems to satisfy the market demands.
- If Cambridge Plastics had a clear manufacturing strategy do you think the problems in (a) above would occur? In a few words define a manufacturing strategy that will guide the company to avoid such conflicts.
- What would you do to solve the problems assuming that you had to compete in both markets due to contractual responsibilities. You may assume that you have access to funding

Question 2

WAM Incorporated is to bid on a contract to produce a small electronic assembly. The contract would require delivery within two years of 30,000 units that are to be manually assembled on a dedicated designed assemble line. The tasks, their precedence and times for the assembly are given in the table. The cost of production is also given

Assembly would be performed on an 8 hour shift with 7.5 hours of productive work with an average of 22 productive days each month. WAM requires a 15%profit margin on the selling price. What should be the selling price in WAM's contract bid?

Task	Task time (min)	Required Precedence	Task	Task time (min)	Required Precedence
A	2	G	F	4	G
B	6	G	G	3	I
C	2	B, D	H	2	C E
D	5	A, F	I	4	none
E	3	D			

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Cost and Time Data

Direct labour cost	\$9/hr.	Variable overhead	10% of direct labour
Direct materials	\$12/unit	Tooling for project	\$100,000
Fixed cost for manufacturing	\$7,000/month		

Question 3

An end item is fabricated from a single component supplied by a local distributor. The end item is produced on a cycle every fourth week, or 13 times per year, during weeks 3, 7, 11, 15, 19, 23, 27, 31, 35, 39, 43, 47, and 51. Annual demand for the item is 52000 units. Each item costs \$3.50, the order cost is \$125 per order. The annual inventory holding cost is 20% of the unit cost and the lead time is a constant one week. Commencing inventory is 4310

- (a) Determine the EBQ
- (b) Determine the weekly inventory for the first 26 weeks of the year when orders are triggered by a re-order point
- (c) Determine the inventory costs for this 26 week period.
- (d) What would be the inventory costs if a lot for lot approach is used
- (e) Explain any savings to be made by using the lot for lot method rather than the EBQ.

Question 4

A company has an order to produce items A and B. The route sheets indicate that both A and B are subject to the same processes performed in the same sequence giving a total lead-time for each of 4 weeks. Current MRP records show the demand for items A and B

- (a) Complete the MRP records for items A and B
- (b) Prepare a loading plan for the four work stations required for the production of A and B for week 1

Component A				
Standard Times (Hours)				
Operation No.	Work Centre	Lead Time (wk)	Set-up time /Batch	Operation Run Time/Unit
1	Metal Cutting	1	1	0.05
2	Pressing	1	3	0.2-
3	Drilling	1	0.5	0.04
4	Finishing	1	2	0.15

Component B				
Standard Times (Hours)				
Operation No.	Work Centre	Lead Time (wk)	Set-up time /Batch	Operation Run Time/Unit
1	Metal Cutting	1	1	0.07
2	Pressing	1	1	0.15
3	Drilling	1	1	0.07
4	Finishing	1	2	0.12

Current MRP Records (Lead-time = 4 weeks and Lot for Lot ordering)									
Component A	Wk. No.	1	2	3	4	5	6	7	8
Gross Requirements		200	240	240	240	170	170	170	230
Scheduled Receipts		170	190	200	230				
Projected On-Hand	140								
Net Requirements									
Planned Order Receipts									
Planned Order Release									

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Current MRP Records		(Lead-time = 4 weeks and Lot for Lot ordering)							
Component B	Wk. No.	1	2	3	4	5	6	7	8
Gross Requirements		200	240	240	240	170	170	170	230
Scheduled Receipts		190	200	240	240				
Projected On-Hand	50								
Net Requirements									
Planned Order Receipts									
Planned Order Release									

End of Examination Paper

