

ADELAIDE UNIVERSITY
DEPARTMENT OF MECHANICAL ENGINEERING
EXAMINATION FOR THE DEGREE OF BACHELOR OF
ENGINEERING
NOVEMBER 2001
MANUFACTURING ENGINEERING 2 (7915)

Time: Three (3) Hours and Ten (10) Minutes

Information for Candidates

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 four (4) of the five (5) questions from Section Two must be attempted

Section One

Question 1

Using one or two sentences answer the follow part questions. All parts carry equal marks. (4 marks each)

- (a) What is achieved by preparing an aggregate plan for production?
- (b) Produce a simple diagram to illustrate the product/process matrix and show where Group Technology is located.
- (c) What are the objectives of JIT or lean manufacturing philosophy?
- (d) What is meant by classifying inventory as A, B or C?
- (e) What is a Kanban system?

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- (f) Draw a simple block diagram of the MRP module with its connections to the other two modules it requires to produce its output of net requirements. What is the content of these other two modules?
- (g) What information does the master production schedule provide?
- (h) How does the make to order master production differ from the make to stock master production schedule and what type of production is associated with each?
- (i) What is the meaning of the terms independent demand and dependent demand as used in inventory planning models
- (j) Define the meaning of loading, sequencing and scheduling

Section Two

Answer four (4) questions. Each question is worth 15 marks

Question 1

Forecasts have indicated that the demand for a product is as shown in the table below. The cost of production, inventory and labour rates are also provided.

Quarter	Demand
1	19,000
2	22,000
3	35,000
4	13,000

The beginning inventory is 1,000 units and it is required to have zero inventory at the end of the 4th quarter.

Production and Inventory Costs

Regular time labour	\$15 per unit
Overtime labour	\$22.50 per unit
Subcontract labour	\$30.00 per unit
Inventory cost	\$3.00 per unit per quarter (based on amount at end of quarter)
Back order costs	\$24.00 per unit per quarter
Hiring of staff	\$300.00 for full time staff
Layoff	\$ 1500.00 for full
Production rate (regular time)	500 units per full time staff per quarter
Overtime	200 units per full time staff per quarter
Initial workforce	44 staff at the start of 1st. quarter

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- (a) Develop an aggregate plan that will use a level rate of output with inventory and back orders being zero at the end of the 4th quarter. (6 marks)
- (b) Develop a chase plan that will result in zero inventory and back orders. (6 marks)
- (c) What are the advantages and disadvantages of each of these plans? (3 marks)

Question 2

A small manual assembly cell is to be designed to supply a sub assembly to an adjacent assembly line at a rate of 1000 units per 450 minute work day. To produce the sub-assembly the tasks required are as given in the table below.

Task	Time Required (s)	Predecessor Tasks
A	11	None
B	7	None
C	12	None
D	11	A, B
E	5	C
F	13	E
G	7	D, F
H	9	None
I	15	G, H

Draw the precedence diagram for the assembly process. (5 marks)

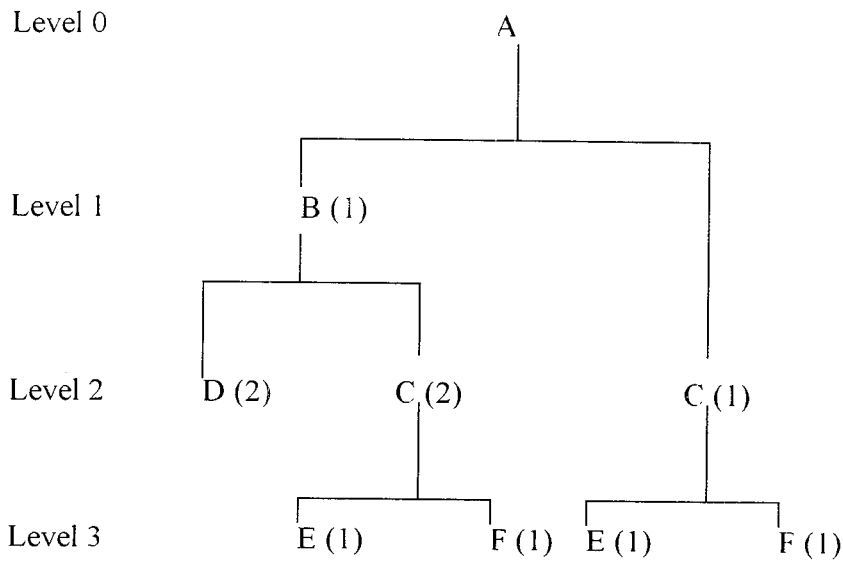
Determine the number of work stations in the cell to supply the product at the necessary rate and the cycle time. (7 marks)

What is the balance delay of the cell? (3 marks)

Question 3

The product structure for product A is shown. Given the lead times, on-hand quantities and the master production schedule, complete the attached MRP table for the scheduled product demand. Ordering can be done on a lot for lot basis. Note that data is to be found on the attached MRP worksheet. (15 marks)

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Question 4

A small manufacturing company has forecast the demand for its product based on an exponential forecasting model that uses a smoothing factor (α) of 0.2. The initial forecast for week 1 was 17000 units and the actual demands were found to be as given in the table.

Week	Actual Demand	Week	Actual Demand
1	17000	6	16000
2	21000	7	20000
3	19000	8	18000
4	23000	9	22000
5	18000	10	20000

Forecast the demand for the 10 weeks and using the actual demand determine the mean absolute deviation (MAD) for the model. (7 marks)

Compute the RSFE and plot the tracking signal and comment on the accuracy of the model. State all assumptions made. (8 marks)

Question 5

Discuss the advantages and disadvantages of working just-in-time and explain why this approach to manufacturing is frequently referred to as a pull system. (15 marks)

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MRP Worksheet for Question

A	Lead Time 1 Wks	1	2	3	4	5	6	7	8
	Gross Requirements								50
	Scheduled Receipts								
	Projected On-Hand 10								
	Net Requirements								
	Planned Order Receipts								
	Planned Order Release								

B	Lead Time 2 Wks.	1	2	3	4	5	6	7	8
	Gross Requirements								
	Scheduled Receipts								
	Projected On-Hand 20								
	Net Requirements								
	Planned Order Receipts								
	Planned Order Release								

C	Lead Time 3 Wk	1	2	3	4	5	6	7	8
	Gross Requirements								
	Scheduled Receipts								
	Projected On-Hand 0								
	Net Requirements								
	Planned Order Receipts								
	Planned Order Release								

D	Lead Time 1 Wks	1	2	3	4	5	6	7	8
	Gross Requirements								
	Scheduled Receipts								
	Projected On-Hand 100								
	Net Requirements								
	Planned Order Receipts								
	Planned Order Release								

E	Lead Time 1 Wk	1	2	3	4	5	6	7	8
	Gross Requirements								
	Scheduled Receipts								
	Projected On-Hand 10								
	Net Requirements								
	Planned Order Receipts								
	Planned Order Release								

F	Lead Time 1 Wk	1	2	3	4	5	6	7	8
	Gross Requirements								
	Scheduled Receipts								
	Projected On-Hand 50								
	Net Requirements								
	Planned Order Receipts								
	Planned Order Release								

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