UNIVERSITY OF TORONTO
FACULTY OF APPLIED SCIENCE AND ENGINEERING

Final Examination, April 19/ 2001

MIE373S - Resource and Production Systems
Type A

Examiner: S. Halim
Duration: 2 ½ hours

Answer all questions

All non-programmable electronic calculators are permitted

MARKS

8 1)

a) List 4 key elements to effective supply chain management. Briefly explain each element.

b) Identify 2 differences between JIT system and MRP. Briefly explain each.

10 2) Provide key words for the following descriptions:

a) An inventory system in which an order is received gradually, as inventory is depleted.

b) A finite scheduling technique, which concentrates on scheduling the bottleneck resources and differentiates between transfer and process batches.

c) A process to determine the resources needed to meet demand over an intermediate time horizon.

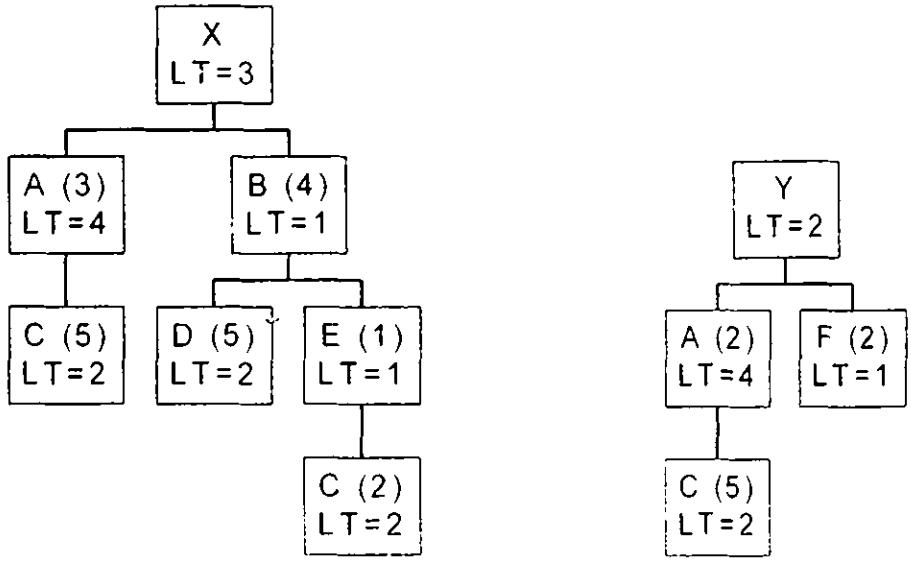
d) A schematic diagram that uses weighted lines to denote location preference.

e) The difference between the late job's due date and its completion time

15 3) A toy company uses MRP to schedule its production. The company has received orders for toys X and Y as follows:
X: 35 cases in period 3, 60 cases in period 5 and 25 cases in period 8
Y: 25 cases in period 2, 65 cases in period 4, 50 cases in period 6 and 35 cases in period 8

a) Given the following information, help them complete MRP records for component A.

Product Structure:



Inventory Master File:

	On Hand	On Order	Scheduled Receipt	Lot Size (multiples)
X	45			50
Y	40			60
A	135	300	Period 2	150
B	85			50
C	1200	300	Period 1	250
D	900	300	Period 3	300
E	175			80
F	65			100

a) If at the end of period 7, the company receives an additional order of 20 cases of toy X for period 8, what would be your response to this order?

b) Suppose the scheduled receipt for component A did not arrive all at once, but instead 200 units were received in period 2 and another 100 arrived in period 3. What action would you recommend?

15 4) ABC Company is trying to determine the production planning strategy for its plant. Giving the following information, use the transportation method to design the production plan and determine the costs.

Month	Demand Forecast
January	2000 units
February	3000 units
March	7000 units
April	4000 units

Regular capacity per month	3000 units
Overtime capacity per month	1500 units
Subcontract capacity per month	unlimited
Regular production cost	$30/unit
Overtime production cost	$40/unit
Subcontract production cost	$50/unit
Inventory holding cost	$5/unit/month
No beginning inventory	
Back order cost	$200/unit, only allowed one month

15 5) Using the data given in the following table and applying Johnson's Rule, determine the sequence that will allow the set of these 6 jobs to be completed as soon as possible. Draw the Gantt chart to show the schedule of each machine centre and determine the total completion time.

Jobs	Machine Centre 1 (hours)	Machine Centre 2 (hours)	Machine Centre 3 (hours)
1	2	1	1
2	5	3	4
3	6	3	7
4	7	4	4
5	4	1	5
6	4	2	1

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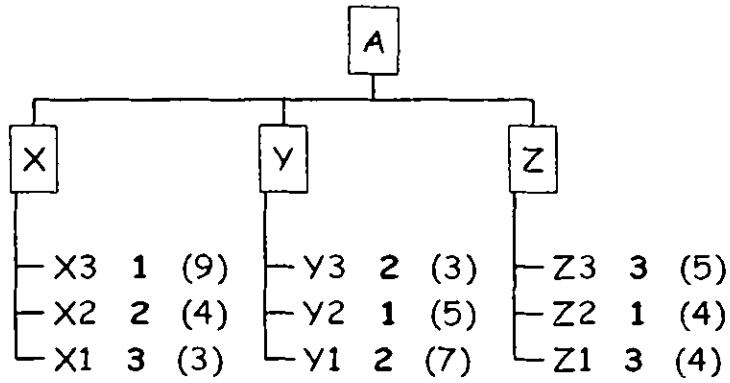
6) The following diagram shows the product structure, routing and processing time for product A. All time (shown in brackets) are in minutes.



Using the Synchronous manufacturing method, design a production schedule for each machine that will produce 50 A's as quickly as possible. Show the schedule on a Gantt chart of each machine and determine the total completion time. Assume one unit of items X, Y and Z are needed to make each A. No set-up time required.

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7) An assembly station produces 70 units of "Back to School" kits per hour. It takes 45 minutes to receive the necessary components from the previous workstation. Completed kits are placed in a rack that holds 12 units. Full racks are sent to the next workstation for wrapping. The company uses a safety stock factor of 12%.

a) Determine number of kanbans needed.

How will the number of kanbans affected:

b) If demand increases to 150 units per hour?

c) If the safety stock factor is reduced by half?

d) If the lead-time is reduced to 15 minutes?

12 8) The processing times and due dates for jobs A, B, C, D, E, and F are shown in the following table.

Tasks	Processing Time (in days)	Due Date
A	8	15
B	10	25
C	14	40
D	7	45
E	5	10
F	6	30

Given the above information, prioritise the following jobs using:

a) SPT

b) DDATE

c) CR

Calculate the average completion times, average tardiness, maximum tardiness and number of jobs tardy for each sequence. Assume today is day 3.

d) Which sequence would you recommend? Explain briefly why.