



UNIVERSITY OF RUHUNA

Faculty of Engineering

End-Semester 5 Examination in Engineering: August 2015

Module Number: ME 5315 Module Name: Production Planning and Control (O/C)

[Three Hours]

[Answer all questions, each question carries 12 marks]

- Q1. a) What are the main objectives of an MRP system? [2.0 Marks]
- b) The theme of MRP is "getting the right materials to the right place at the right time". Discuss this statement. [2.0 Marks]
- c) A manufacturing company has received an order for 500 units of product H to be delivered in 10 weeks. The product tree structure of product H is shown in Figure Q1 and the data from available records are shown in Table Q1.1. Prepare the materials requirement plan to satisfy the customer demand.
Note: You may use Table Q1.2 given in page 5. [8.0 Marks]
- Q2. a) What is the purpose of aggregate planning? [2.0 Marks]
- b) Describe four demand and capacity options for implementing plans. [4.0 Marks]
- c) A factory employs a permanent workforce that is capable of providing a normal production capacity of 400 units per month. In addition to the normal capacity, 50 additional units can be produced by overtime. The variable cost of carrying stock is Rs. 200/= per unit per period. The opportunity cost of lost sales (unmet demand) is estimated to be Rs. 500/= per unit. There is an additional cost of Rs. 100/= per unit under overtime production. The demand pattern for first half of year 2002 is given in Table Q2.
A constant workforce planning strategy has been proposed to produce only a constant quantity of 350 units per period under normal production.
- I. Tabulate the closing stock and lost sales for each period and calculate the resulting total cost for the given production planning strategy.
 - II. State the weaknesses of the production plan.
 - III. Propose an alternative plan and calculate the resulting total cost. [6.0 Marks]

- Q3. The Morris Machine Company just received an order to refurbish five motors that were damaged in a fire. The motors have been delivered and are available for processing. The motors will be repaired at two workstations in the following manner.

Workstation 1: Dismantle the motor and clean the parts.

Workstation 2: Replace the parts as necessary, test the motor, and make adjustments.

The customer's shop will be inoperable until all the motors have been repaired, so the plant manager is interested in developing a schedule that minimizes the makespan and has authorized to work whole day and night without stopping until the motors have been repaired. The estimated time to repair each motor is shown in Table Q3.

- a) Prepare a schedule that minimizes the makespan and find the throughput time. [8.0 Marks]
- b) Display the schedule in a Gantt Chart. [4.0 Marks]
- Q4. Air travel by the passengers using Sri Lankan Airlines for the past 12 weeks is shown in Table Q4.
- a) Explain why an averaging technique would not be appropriate for forecasting in future travel demand.
Hint: You may plot the given data on a sheet of graph paper. [2.0 Marks]
- b) Use the following two techniques to develop a forecast for the expected number of passengers for the weeks 11 to 13.
- I. Trend adjusted exponential smoothing with $\alpha=0.40$ and $\beta=0.30$
 - II. A Trend equation [8.0 Marks]
- c) From the above two methods (b. I and b. II), which method gives the higher accuracy in calculating Mean Absolute Deviation (MAD). [2.0 Marks]
- Q5. A particular Machine Shop specializes in overhauling outboard marine engines. Some engines require replacement of broken parts, whereas others need a complete overhaul. Currently, five engines with varying problems are awaiting the service. The best estimates for the labor times involved and the promise dates (in number of days from today) are shown in Table 5. Customers usually do not pick up their engines early.
- a) Develop separate schedules by using the SPT, FCFS and EDD rules. [6.0 Marks]
- b) Compare the three schedules on the basis of average completion time, utilization and average job lateness. [6.0 Marks]

Table Q1.1: Data from available records

Item	On hand	Safety stock	Already allocated
H	100	50	0
G	200	30	60
F	52	30	20
A	50	20	30
C	60	20	30
B	150	20	30
D	52	20	30
E	500	300	150

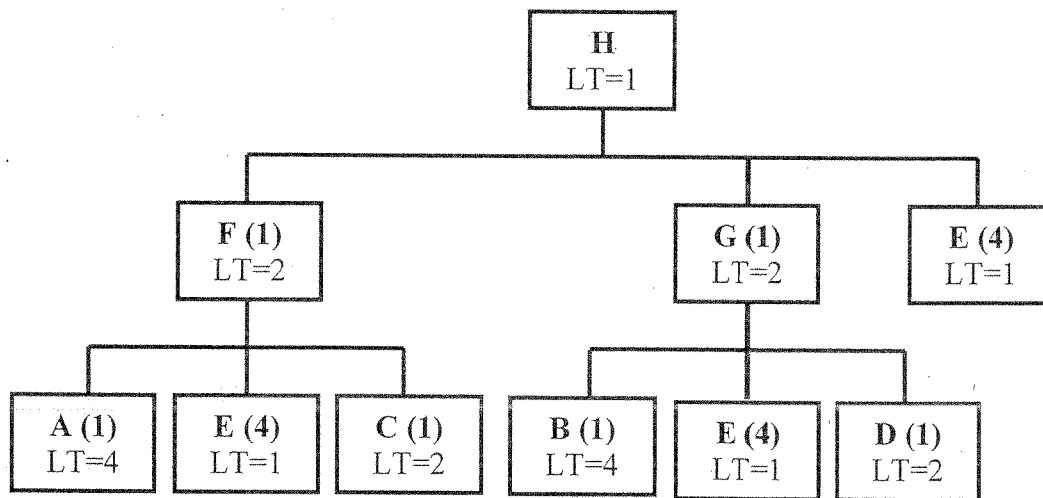


Figure Q1: Product structure

Table Q2: The demand pattern for first half of year 2002

Period	Demand (units)
Jan	300
Feb	400
Mar	300
Apr	750
May	400
June	500

Table Q3: Estimated time to repair each motor

Motor	Time (hours)	
	Workstation 1	Workstation 2
M1	12	22
M2	4	5
M3	5	3
M4	15	16
M5	10	8

Table Q4: Use of Sri Lankan Airlines by the passengers

Week	No. of Passengers
1	405
2	410
3	412
4	415
5	412
6	420
7	424
8	433
9	438
10	440
11	446
12	451

Table Q5: Best estimates for the labor times involved and the promise dates

Engine	Time since order arrived (days)	Processing time (days)	Promise date (days from now)
Engine 1	4	5	8
Engine 2	6	4	15
Engine 3	8	10	12
Engine 4	1	1	20
Engine 5	15	3	10

Table Q1.2: MRP Table for Question Q1(c)

Part	Description	Week									
		01	02	03	04	05	06	07	08	09	10
	Gross Requirements										
	Scheduled Receipts										
	Projected Available Balance										
	Net Requirements										
	Planned Order Receipts										
	Planned Order Release										
	Gross Requirements										
	Scheduled Receipts										
	Projected Available Balance										
	Net Requirements										
	Planned Order Receipts										
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