Exam Date & Time: 08-Jan-2024 (02:30 PM - 05:30 PM)



MMF 4048

MANIPAL ACADEMY OF HIGHER EDUCATION

Production Planning and Control [MME 4048]

Marks: 50

Duration: 180 mins.

Descriptive

Answer all the questions.

1A) The monthly forecast for a product and production days available are given in the table below

Month	January	February	March	April
Aggregate	1260	1430	1100	880
Demand (Units)				
Production Days	21	22	20	22

(5)

(3)

(2)

The Management is considering hiring and laying off workers as needed to meet exact monthly requirements. Assume that there are 10 workers at the beginning of January. The workers are paid at the rate of \$72 per day for 8 hours of working. It requires 1.6 hours to produce one unit for a worker. The hiring cost is \$ 1000/worker and lay-off cost is \$ 1400/worker. Prepare the aggregate plan using the above strategy and determine the total cost of the plan?

1B)

The quarterly sales data for a school bag manufacturing company experiencing seasonal pattern for the past two years is as shown below

		Qua	rters	
Year	Q1	Q2	Q3	Q4
2021	800	1600	2000	400
2022	1040	2080	2600	520

If the company expects that the likely volume of sales in 2023 is 8112, forecast the volume of sales for each quarter of the year

- 1C) Identify and briefly explain the general characteristics of a production activity manufacturing Domestic Refrigerators.
- 2A) The sales of a product in the past 5 years are given below. Develop the equation for the line of best fit and determine the forecast for 2023.

Year	2018	2019	2020	2021	2022
Sales ('000)	108	119	110	122	130

2B) Following table shows the machining time in hours for 5 jobs to be processed on (3) machines in the order A first and B next.

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Job	1	2	3	4	5
Machine A	3	7	4	5	7
Machine B	6	2	7	3	4

Determine the optimal sequence in which the jobs should be processed and idle time for both the machines.

- 2C) Explain the widely used variables of aggregate planning in our country with respect to a continuous or mass production activity. (2)
- 3A) The annual requirement of an item is 25,000 units. Its price is Rs. 10/ unit for order quantities up to 1499 units, Rs. 9.95 / unit for order quantities between 1500 and 2999 units. and Rs. 9.9 / unit for order quantities of 3000 and above. The inventory carrying cost is Rs. 2 / unit / year. The ordering cost is Rs. 200 / order. Determine the optimum ordering policy. (Graphical illustration not required) (5)
- 3B) The rate of demand for an item is 100 units / week and the normal lead time is 5 weeks. Calculate the Safety Stock and ROP in the following cases

 (i) If Safety Stock is assumed to be 25% of lead time consumption.
 (ii) If Safety Stock is assumed to be of 2 weeks requirement.
 (3)
 (iii) If the maximum lead time basis is to be used and the maximum lead time in the past has been 6 weeks.
- 3C) The demand for an item is 18,000 units/year. The purchase price is Rs.1 per Unit. Ordering cost is Rs.400 per order. Inventory carrying cost is 120% of unit cost per unit per year. No shortages are allowed. Assume instantaneous supply and determine the (2) optimal order quantity and total annual cost.
- 4A) The Gross requirement for dependent demand item X is shown in the table. It is purchased and has a lead time of 2 weeks.

Week	1	2	3	4	5	6	7	8	
Gross									
require	150	250	650	500	150	200	550	500	(.
ments									

The order quantity for X is 800 units. At present there are 500 units of X on hand. Show the MRP working for current schedule.

4B) Determine the EOQ, safety stock, ROP to represent them graphically given the following data Ordering cost =Rs.13.5/order. Carrying cost rate =20% Purchase Price = Re.0.1/unit Monthly usage = 450 units Lead time = 2 months Safety stock = 5% of lead time consumption

4C) Highlight the actions initiated by the inventory section of a manufacturing organization with regard to 'A' class and 'C' class items. (2)

5A)

(5)

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Table below depicts the tasks, assembly time and sequence requirements for a product.

Work element (task)	Α	в	С	D	E	F	G	Н	Ι	J	К	
Time (secs)	40	80	30	25	20	15	60	45	10	75	15	Total: 415
Immediate Predecessor (s)	-	Α	A	В	С	В	В	D	E,G	F	H,I,J	

Draw the precedence diagram and balance the assembly line if the desired output rate is 40 units per hour using the longest work element time heuristic to assign jobs to the workstations and calculate the efficiency.

- 5B) Annual demand for an item is 48,000 units/year. The production capacity is 96000 units per year. The production cost per unit is Rs. 20/- Inventory carrying cost is estimated to be Rs. 3.6/unit/year. The cost of one setup is Rs. 400. Determine the quantity of (3) inventory consumed during the inventory production period?
- 5C) What is the necessity for maintaining inventory of raw materials in our country?

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(2)