Exam Date & Time: 04-May-2024 (02:30 PM - 05:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

OPERATIONS AND SUPPLY CHAIN MANAGEMENT [MME 3253]

Marks: 50 **Duration: 180 mins.**

Des

Answer all the questions.

Data missing if any, may be suitably assumed

1A)	The following data refers to an aggregate planning problem. The demand in Units is 700, 1300, 960, and 890 for Quarters I, II, III, and IV respectively. Working duration in days is 70, 65, 64, and 61 respectively for Quarters I, II, III, and IV. The company is considering manufacturing at a uniform rate of 12 units/day during regular time and using overtime to meet the remaining demand. The cost of producing during regular time is $100/unit. The cost of producing during overtime is $120/unit. The inventory carrying cost is $ 6/unit/quarter. Prepare the aggregate plan and calculate the total cost of the plan if there is an incoming inventory of 100 units and a final inventory of 200 units is desired.	(5)
1B)	Quoting a suitable example, mention the characteristics of a continuous production activity.	(3)
1C)	Enumerate the functions of production, planning and control.	(2)
2A)	The farm yield in tons of a farm is recorded as 1.3, 1.7, 1.2, 1.9, 1.8, and 1.4 respectively for six years from year-1 to year-6. Similarly, the rainfall data correlates with the same year's yield. The rainfall in meters is 3, 3.4, 2.8, 3.6, 3.5, and 3.3 respectively for six years from year-1 to year-6. What is the expected yield for the 7th year, if the likely rainfall for the next year is 3.7 meters?	(5)
2B)	The following data refers to the sale of television sets. Sales in a thousand units are 10, 14, 11, 13, 14 and 16 respectively for six weeks from week-1 to week-6. Develop the predictive model taking a smoothing co-efficient of 0.4 and estimate the forecast for the 7^{th} week.	(3)
2C)	Describe the variables and strategies of aggregate planning.	(2)
3A)		(5)

Determine the optimum schedule for processing of six jobs on machines using the Index method.

	Process timings (Minutes) on Machines			
Jobs	A	B	C	D
1	10	15	14	12
2	18	20	22	27
3	17	21	25	28
4	16	17	24	25
5	23	30	27	35
6	18	23	29	32
Total Hours available	50	45	50	55

3B) A supplier to the electric utility industry has a heavy product and the transportation costs are high. More than 600000 Tons are to be shipped to 8 major customer locations whose X-Y coordinates and quantity shipped are as shown in the table below in the table. Calculate the center of gravity for its new office.

Location	A	B	C	D	E	F	G	H
Tons shipped	5000	92000	70000	35000	9000	227000	16000	153000
X-Y Co-ordinates	(07,13)	(08,12)	(11,10)	(11,07)	(12,04)	(13,11)	(14,10)	(15,05)

(3)

3C) Explain the Sales Force Estimate method of forecasting. (2)

4A) Determine the Economic Order Quantity, Safety Stock, and reorder point & represent them graphically (Draw on e-pad only) for the given following data.
Ordering Cost = Rs. 13.5 / order
Carrying Cost rate = 20%
Purchase Price = Rs. 0.1 / unit
Monthly Usage = 450 units
Lead Time = 2 months
Safety Stock = 5% of lead time consumption. (5)

4B) Prepare the Materials requirement planning (MRP) format for the details as given. The gross requirements in units are 40, 85, 10, 60, 130, 110, 50 and 170 for eight weeks from Week 1 to Week 8 respectively. On hand available at the beginning is 140 units. The lot size is fixed order basis with 200 Units. The lead time is 2 weeks and safety stocks are not needed. (3)

4C) Describe ABC analysis in inventory theory. (2)

5A) Johnson Cogs want to set up a line to produce 60 units per hour. The work elements and their precedence relationships are shown in the following table. (5)

Work element (task)	Time (seconds)	Immediate Predecessor(s)
A	40	--
B	30	A
C	50	A
D	40	B
E	6	B
F	25	C
G	15	C
H	20	D, E
I	18	F, G
J	30	H, I

What is the desired cycle time?
What is the theoretical minimum number of workstations?
Draw the precedence diagram and balance the assembly line using the longest work element time rule.

5B) A company has been producing and selling a certain product for the past 3 years in the domestic market at a price of Rs.80/unit. The fixed cost/year is Rs.5,00,000 and the variable cost is Rs.50/unit. However, the sales volume has come down to 15,000 units owing to stiff competition in the domestic market. The company is considering exporting the product to a neighbouring country for which the variable cost is Rs.60/unit and the selling price is Rs.70/unit. How many units of the product the company must export to break even? Show it with the help of a Profit-Volume chart (Draw on e-pad only). (3)

5C) What are the components of inventory carrying costs? (2)

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