Reg. No.



MANIPAL INSTITUTE OF TECHNOLOGY MANIPAL

VI SEMESTER B.TECH (MECHATRONICS ENGINEERING) **END SEMESTER EXAMINATIONS, APRIL 2017** SUBJECT: PRODUCTION OPERATIONS MANAGEMENT [MTE 4022] **REVISED CREDIT SYSTEM** (22/04/2017)

Time: 3 Hours

MAX. MARKS: 50

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Instructions to Candidates:

- ✤ Answer ALL FIVE FULL questions.
- ✤ Missing data may be suitably assumed.
- 1A. There is an annual requirement of 12000 units whose unit price is Rs.10/-. It is 04 manufactured at the rate of 2000 units per month. The set up cost per production run is Rs. 3000/- The inventory carrying cost is Rs. 20/unit/year. The shortage cost is estimated to be Rs. 3/unit/month. Calculate the EOQ, shortage and total inventory carrying cost per year?
- 1B. Explain the use of SPT rule and Critical Ratio Rule in scheduling. 02
- 1C. 04 Explain the Production Consumption Cycle with the help of a neat diagram.
- 2A. The gross requirements for an item are shown below. Prepare the MRP working sheet 03 if the order quantity for the item is 70 units, lead time is 4 weeks and a safety stock of 40 units to be maintained. There is a scheduled receipt of the order quantity at the beginning of the second week. The on hand inventory is 65 units.

Week	1	2	3	4	5	6	7	8	9	10	11	12
Gross Requirement	20	20	25	20	20	25	20	20	30	25	25	25

2B. A manufacturer has the following information on its major product. R.T. production capacity = 2600 units/period. O.T. production capacity = 300 units/period. R.T. cost = Rs.100/unit. Incremental O.T. cost = Rs. 20/unit. Inventory carrying cost = Rs. 10/unit/period.Back order cost = Rs.20/unit/period. Beginning Inventory = 400 units.

Demand for periods 1, 2, 3 and 4 are 4000, 3200, 2000 and 2400 units respectively. Develop the aggregate plan so that there will be zero inventory at the end of period 4 and determine the total cost of the plan. The cost of unutilized capacity during regular time is Rs. 50/unit.

3A. Santro Electronics is considering two locations for its Audio Equipment Factory. One 02 location option is Hyderabad and the other is Chennai. At Hyderabad, the fixed cost of the factory is estimated at Rs.1 million and the variable cost at Rs.1200 per audio equipment manufactured. At Chennai, the fixed cost of the factory is estimated at Rs. 1.2 million and the variable cost at Rs.1100 per audio equipment manufactured. The

selling price of the equipment will be Rs.3000 per unit irrespective of the place of manufacture. Decide, using break-even analysis, which location is best for the factory

A company manufacturing products, whose demand is seasonal, wants to develop the 3B. forecast for the next year. The data pertaining to the demand for last three years are given below:

Year	Quarter I	Quarter II	Quarter III	Quarter IV
1	103	95	118	110
2	126	116	142	131
3	144	137	159	150

Calculate seasonal indexes for each quarter and perform regression analysis to forecast the demand for the next 4 quarters.

- 4A. Explain the basic difference between a weighted moving average and exponential 02 smoothing.
- 4B. The assembly line of a certain factory has a number of tasks to be performed 04 according to the precedence requirements given in the table below.
 - a) What is the minimum number of stations?
 - b) How many stations are required if the longest work element time method is used?
 - c) How many stations are required if the largest number of followers method is used? d) What is its efficiency?

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Task	Task time(min)	Precedence
Α	4	
В	2	
C	5	
D	3	A,C
Е	4	D
F	2	D
G	3	B,E,F
Η	2	G

4C. The Oil India Corporation (OIC) is wondering whether to go for an offshore oil 04 drilling contract that is to be awarded in Bombay High. If OIC bid, value would be `600 million with a 65 per cent chance of gaining the contract. The OIC may set up a new drilling operation or move the already existing operation, which has already proved successful for a new site. The probability of success and expected returns are as follows:

Outcome	New Drilling Operation		Existing Operation			
	Probability	Expected Revenue	Probability	Expected Revenue		
Success	0.75	800	0.85	700		
Failure	0.25	200	0.15	350		

If the Corporation do not bid or lose the contract, they can use `600 million to modernize their operation. This would result in a return of either 5 per cent or 8 per cent on the sum invested with probabilities 0.45 and 0.55. (Assume that all costs and revenue have been discounted to present value.)

(a) Construct a decision tree for the problem showing clearly the courses of action.

(b) By applying an appropriate decision criterion recommend whether the Oil India Corporation should bid the contract.

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5A. Eight jobs are to be processed using any of the 5 machines whose available capacities are 35 hours each in the current schedule. The time taken by each machine to complete each job is given in hours in the following table. Allocate the job by FCFS and index method and compare the results.

Jobs	Machines						
	А	В	С	D	E		
1	10	12	14	11	13		
2	12	13	15	11	14		
3	14	16	19	21	24		
4	15	19	21	27	30		
5	8	9	12	10	15		
6	15	13	14	12	10		
7	10	11	13	15	17		
8	12	15	15	17	19		

5B. Derive the equation for Purchase model with shortages to find Total cost /year, EOQ **05** and Maximum Shortage in the cycle.