Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

DEPARTMENT OF MECHATRONICS ENGINEERING

VII SEMESTER B.TECH. (MECHATRONICS)

MAKEUP EXAMINATIONS, DECEMBER 2021

SUBJECT: PRODUCTION AND OPERATIONS MANAGEMENT [MTE 4080]

(27.12.2022)

Time: 180 MINUTES **MAX. MARKS: 50**

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data if any can be suitably assumed

Q. No	QUESTIONS	M	CO	PO	LO	BL
1A.	A food processing company wants to forecast the next month's demand. The actual demand in the past 9 months is as shown below. Week: 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 Patient Arrival: 105 | 106 | 110 | 110 | 114 | 121 | 130 | 134 | 137 Determine the exponential smoothing forecast for 10th month. For a given period of time calculate smoothing constant. Also calculate Mean Absolute Percentage error for the given trend.	**4**	**1**	**1, 2, 3**	**1**	**3**
1B.	Use SPT and EDD rule schedule the 8 tasks given below on a single processor. Calculate MFT and average tardy jobs. Tasks: 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 Time (Hrs): 4 | 2 | 7 | 1 | 5 | 3 | 6 | 5 Due date: 10 | 6 | 14 | 5 | 15 | 12 | 26 | 20	**3**	**4**	**1, 2, 3, 5**	**2**	**5**
1C.	Determine EOQ, safety stock for the given the following data. Ordering cost = Rs. 13.5/order Carrying cost = 20% Purchase Price = Re. 0.1/unit Monthly usage = 450 units. Lead time = 2 months	**3**	**4**	**1, 2, 3, 5**	**2**	**5**
2A.	The following are the cost and sales data of a manufacturer selling 2 products A and B. Product A: Selling Price/Unit 10; Variable Cost/Unit 7; % of rupee sales volume 40% Product B: Selling Price/Unit 12; Variable Cost/Unit 9; % of rupee sales volume 60% Annual capacity of the manufacturer is Rs.24,00,000 of total sales value. Annual	**5**	**1**	**1, 2, 3**	**1**	**3**

	fixed cost is Rs.5,40,000. • Determine BEP in terms of rupee sales volume and the contribution from the respective products, which are available for recovering the fixed cost. • Draw profit volume chart for Profit at 40% of the capacity.					
2B.	The demand for an item is 75000 units per year. The ordering cost is Rs. 144 per order. The inventory carrying cost rate is 25% of purchase price. The purchase price depends on the order quantity and is shown in the table. Minimum of 500 units are to be ordered a time. Determine the most economic order quantity.	**3**	**2**	**1, 2, 3, 4, 5**	**3**	**4**
2C.	Derive EOQ and its associated cost for the purchase model without shortages with instantaneous delivery. Use suitable notations and assumptions	**2**	**2**	**1, 2, 3, 4, 5**	**3**	**4**
3A	Three jobs are to be processed through vertical machining center (VMC) and special purpose machine (SPM) in order VMC and then SPM. The processing times (min.) are given below. Determine total elapsed time and idle time on special purpose machine using SPM and EDD.	**5**	**2**	**1, 2, 3, 4, 5**	**3**	**4**
3B	The following 10 jobs are to be processed by any of the 4 machines whose available capacities are 65 hours each in the current schedule. The time taken by each machine to complete each job is given in hours in the following table. Calculate the mean flow time using INDEX method.	**3**	**2**	**1, 2, 3, 4, 5**	**2**	**4**
3C	List-out the functions of production system	**2**	**3**	**1, 2**	**3**	**5**
4A	The following data refers to an aggregate planning problem. The company uses pure strategy of employing only regular time production at uniform rate and inventory carrying to meet the demand. Shortages are not permitted. The regular time production cost is Rs. 50/unit. The inventory carrying cost is Rs. 3/unit/quarter. Calculate the beginning inventory to use this plan and determine the total cost of the plan.	**5**	**2**	**1, 2, 3, 4, 5**	**1**	**3**

Purchase price	6	5.75	5.6	5.5
Order quantity	500-999	1000-1499	1500-1999	2000 & above

Machine	Jobs		
	1	2	3
VMC	18	14	7
SPM	4	9	8

Job No.	Machines			
	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	12	20	17	Impossible
6	16	22	19	28
7	12	Impossible	18	22
8	15	18	16	20
9	25	30	27	35
10	18	25	29	32
Available Time (Min.)	65	65	65	65

	<table><tr><th>Qtr.</th><th>Demand</th><th>Days</th></tr><tr><td>1</td><td>300</td><td>72</td></tr><tr><td>2</td><td>310</td><td>84</td></tr><tr><td>3</td><td>460</td><td>76</td></tr><tr><td>4</td><td>480</td><td>81</td></tr></table>					
4B	Today is day 48 on the shop calendar and 4 jobs are on order as shown. Determine critical ratio for each job and assign priority ranks. Also determine mean flow time, average number of jobs in the system. <table><tr><th>Job</th><th>Due Date</th><th>Work remaining (Days)</th></tr><tr><td>A</td><td>48</td><td>8</td></tr><tr><td>B</td><td>46</td><td>2</td></tr><tr><td>C</td><td>44</td><td>2</td></tr><tr><td>D</td><td>50</td><td>12</td></tr></table>	**3**	**3**	**1, 2, 3, 4, 5**	**3**	**5**
4C	Draw the cost vs quantity chart to mention the behaviour of different costs with respect to change in quantity	**2**	**1**	**1, 2, 3**	**2**	**4**
5A	Write a note on break-even point and methods of achieving early break-even point.	**2**	**4**	**1, 2, 3, 5**	**1**	**3**
5B	A manufacturing company is considering the expansion of one of its product line by adding additional capacity. The capacity of the present line is 1 ton. The process consists of loading, processing and unloading. Putting all together, the processing time for one ton is 30 min. The line can work 80% of the shift due to power restriction and availability of material handling equipment. The expected output of the new layout is to be 16tons per shift of 8 hours. Plant (system) efficiency is 50% of the system capacity. Find the number of lines required and estimate the percentage of time the line will be idle.	**3**	**1**	**1, 2, 3**	**1**	**3**
5C	White valley ski resort is planning the ski lift operation for its new ski resort. Management is trying to determine whether one or two lifts will be necessary; each lift can accommodate 250 people per day. Skiing normally occurs in the 14 week period from December to April, during which the lift will operate seven days per week. The first lift will operate at 90% capacity if economic conditions are bad, the probability of which is believed to be about 0.3. During normal times the first lift will be utilized at 100% capacity and the excess crowd will provide 50% utilization of the second lift. The probability of normal times is 0.5. Finally if times are really good, the probability of which is 0.2, the utilization of the second lift will increase to 90%. The equivalent annual cost of installing a new lift, recognizing the time value of money and the lift's economic life is $50000. The annual cost of installing two lifts is only $90000 if both are purchased at the same time. If used at all each lift cost $200000 to operate, no matter how low or high its utilization rate. Lift tickets cost $20 per customer per day. Draw decision tree and determine whether the resort should purchase one lift or two.	**5**	**2**	**1, 2, 3, 4, 5**	**3**	**5**