Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent institution of MAHE, Manipal)

VI SEMESTER B.TECH. (MECHATRONICS ENGINEERING)
END SEMESTER MAKE UP EXAMINATIONS, 2018
SUBJECT: PRODUCTION & OPERATIONS MANAGEMENT [MTE 4022]

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be assumed suitably

1A Differentiate between goods and services. **02**

1B Product 800 is made from two 801 subassemblies, three 802 subassemblies and two 803 subassemblies. An 801 subassembly consists of two units of component 406 and two units of component 407. The 802 subassembly is made from two units of component 205 and one unit of component 603. An 803 subassembly consists of one unit of component 407, one unit of component 950 and three units of 747 subassemblies. A 747 subassembly is made from six units of item 910, three units of item 205, and one unit of item 407. Draw the product structure tree for product 800 and determine how many units of components 407, 910 and 205 are required to produce 186 units of product 800? **03**

1C A company has a demand of 24,000 units per year for an item. The purchase price is Rs. 50/unit. The ordering cost is Rs. 400/order. The inventory carrying cost is Rs. 10/unit/year. The shortage cost is Rs. 1.25/unit/month. Determine total cost per cycle and total shortage cost per year. **05**

2A Explain the use of SPT rule and critical ratio in scheduling. **03**

2B A businessman believes that the sale of a product is correlated to the number of 2 wheelers registered in the city 2 years back. The following data is available for the past 9 years. Determine the equation for the line of correlation and give the forecast for 2008 and 2009. **04**

Year	1999	2000	2001	2002	2003	2004	2005	2006	2007
Sales Y ('000)	3	3.8	5.2	5.8	7.2	8.8	10.2	11.9	13.7
X 2 wheelers registered ('000)	2	2.5	4	4.2	6.1	7.3	9.8	12.2	15.8

2C An automobile manufacturing company is planning to expand its capacity to cater to the growing demand. The search has been maneuvered down to 4 possible locations. Assessment of these sites in terms of 7 location factors, the factor weights and scores (1 = poor, 5 = excellent) are shown in the table below. Calculate the weighted score of each location. Which location would you recommend? **03**

#	Location Factor	Weight Factor	Factor score for each location			
			A	B	C	D
1	Labour Climate	30	2	3	5	1
2	Quality of life	5	5	4	3	5
3	Transportation System	15	2	5	5	4
4	Proximity to markets	25	5	3	4	4
5	Proximity to materials	5	3	2	3	5
6	Land & Construction costs	15	5	4	2	1
7	Utilities	5	3	4	3	5
	Total	100				

3A What is EOQ? Derive an expression for the EOQ for a purchase model with shortage. **05**

3B A company is setting up an assembly line to produce 192 units per eight hour shift. The following table identifies the work elements, time and immediate predecessors. **05**

Task	Time (secs)	Immediate Predecessor(s)
A	40	----
B	80	A
C	30	D,E,F
D	25	B
E	20	B
F	15	B
G	120	A
H	145	G
I	130	H
J	115	C,I
Total	720	

a. What is the desired cycle time?
b. What is the theoretical minimum number of stations?
c. Use the longest work element time rule and balance the assembly line.
d. What are the resulting efficiency and balance delay percentages?

4A 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. Sking 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 Rs. 50,000. The annual cost of installing two lifts is only Rs. 90,000 if both are purchased at the same time. If used at all each lift costs Rs. 2,00,000 to operate, no matter how low or high its utilization rate. Lift tickets cost Rs. 20/- per customer per day. Draw the decision tree and determine whether the resort should purchase one lift or two. **05**

4B A certain product has a 6 month demand cycle as shown below. Each unit requires 10 worker hours to be produced at a labour cost of Rs. 6/- per hour as regular rate. There are currently 20 workers employed in the subject department and hiring cost for additional workers are Rs. 300/- per person and lay off costs are Rs. 400/- per person. Working hours are 8 hours per day. The aggregate plan proposed is to vary the workforce size to accommodate the demand. Calculate the cost of the plan. **05**

	Jan	Feb	March	April	May	June
Demand	380	576	480	60	256	384
Work days	25	20	24	25	20	24

5A Five jobs will have to be processed through 3 machines A, B and C in the order A,B,C. Processing time in hours are given below in the following table. **04**

Job	1	2	3	4	5
Machine A	16	20	12	14	22
Machine B	10	12	4	6	8
Machine C	8	18	16	12	10

Determine the sequence that minimizes the total time required for processing all the jobs and also the idle time for three machines.

5B Annual requirement for an item is 9000 units. It is manufactured at the rate of 3000 units / month. The production cost is Rs. 1000 / unit. The carrying cost rate is 18%. Shortage cost is estimated to be Rs. 10 / unit / month. The setup cost / production run is found to be Rs. 10,000. Calculate i) Economic Lot Size ii) The interval between production runs iii) The production time / cycle iv) Maximum level of inventory v) Maximum shortage vi) Total Annual Cost. **06**