Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

VII SEMESTER B. TECH (IP ENGG.) END SEMESTER EXAMINATIONS, NOVEMBER 2018

SUBJECT: PRODUCTION AND OPERATIONS MANAGEMENT [MME 4112]

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.

1A. A supplier to the electric utility industry has a heavy product, and transportation costs are high. One market area includes the lower part of the Great lakes region and the upper portion of the Southeastern region. More than 600000 tons are to be shipped to eight major customer locations as shown in table. **03**

Customer Location	1	2	3	4	5	6	7	8
Tons shipped (000's)	5	92	70	35	9	227	16	153
XY coordinates	(7,13)	(8,12)	(11,10)	(11,7)	(12,4)	(13,11)	(14,10)	(15,5)

Calculate the center of gravity as a possible location from the new facility, and draw the diagram.(round to the nearest value)

1B. A media center must determine how many digital processes are required to maintain an output of 200 good prints per hour. The setup and exposure can theoretically be done in 2 minutes per print, but operators are on the average only 90% efficient, and in addition 5% of the prints must be scrapped and redone. Also, the processors can be utilized only 70% of time. **03**

a) What is the required system capacity in prints per hour?
b) What average output per hour can be expected from each processor, taking its use factor and efficiency into account?
c) How many processors would be required?

1C. A company has three decision options: to manufacture the drug, to sell the idea to some other company or to conduct a market study. If it decides to manufacture the drug outright, the drug has a 70% chance of success with profit of Rs. 12 lakhs, while its failure will result in a loss of Rs, 2, 00,000. If the company conducts market study, there is an 80% chance that the study will give a positive report. After the positive report of the study, if the company decides to manufacture the drug, there is an 80% chance that the drug will be a success leading to a profit of Rs. 10, 00,000 while a failure will result in a loss of Rs. 3 lakhs. After the negative report of the study if the company manufacture the drug, there is a 30% chance that the drug will be a success leading to a profit 0f Rs.10 lakhs while a failure will result in a loss of Rs. 3,00,000. A competitor company is willing to pay Rs.5, 00,000 if the company **04**

sells the idea to it before market study, Rs.6, 00,000 if the company conducts study revealing positive report and Rs.4, 00,000 if the company conducts study revealing negative report. Draw the decision tree and select the best alternative

2A. A company manufactures 3 products namely A, B and C. The cost for these products is as shown below: **03**

Product	Selling price/unit (₹)	Variable cost/unit (₹)	Percentage of quantity sales
A	10	5	20%
B	8	4	30%
C	5	2	50%

The total fixed cost is ₹ 14,800. Calculate the following:

i. Overall break-even quantity and the contribution from respective products, available for recovering the fixed cost.
ii. Profit at a sale volume of 50% above BEP and the contribution available from the three products in the total profit.
iii. Loss at a sales volume of 25% below BEP and the contribution from the three products that falls short in recovering the total fixed cost.

2B. XYZ manufacturing company has developed a forecast for an item that has the following demand. **03**

Month	1	2	3	4	5	6	7	8
Demand	220	170	400	600	380	200	130	300

Cost of carrying inventory = ₹ 50/unit/month
Cost of RT = ₹ 10/unit
Cost of OT = ₹ 20/unit
Cost of hiring = ₹ 100/unit
Cost of layoff = ₹ 150/unit
The management decides to maintain a constant production rate of 200 units/month or RT basis and permit 20% of RT production as OT, whenever the demand exceeds the RT production rate. Moreover, to meet the further demand, the firm opts for hiring and laying-off strategy. Find the total cost of this mixed strategy.

2C. The quarterly sales data for the past 2 years is shown below. Determine the seasonal factors and perform regression analysis to forecast the demand for the next 4 quarter **04**

Period(Quarter)	1	2	3	4	5	6	7	8
Demand	300	540	885	580	416	760	1191	760

3A. A firm needs to develop a sales forecast for next year for its RVs sales. It believes that annual sales are related to the sales of its industry. It has prepared these historical data. If estimates of Industry sales next year are 725 million rupees, use simple linear regression to forecast the annual demand for the firm's RVs for next year. **03**

Industry Sales (millions of rupees)	Firm's Annual Sales (number of RVs)
536	98
791	137
650	112
813	145
702	120
575	103
684	116

3B. Six jobs are to be processed on a particular machine. The processing time in days and the due dates are shown below. **03**

Job	1	2	3	4	5	6
Processing Time (days)	5	4	2	7	3	5
Due date (days hence)	12	10	9	20	18	14

Schedule the jobs using Shortest Processing Time (SPT) rule, determine the optimum sequence and calculate mean flow time, average job lateness & average number of jobs in the system.

3C. A manufacturing company processes 5 different jobs on three machines A, B and C, their processing times on A, B and C are given below. Find the optimal sequence, total elapsed time , idle time for all the machines and Total processing time for Machine A, B and C **(04)**

Job	Processing time(Minutes)		
	M/C A	M/C B	M/C C
1	15	10	9
2	22	12	17
3	12	6	15
4	18	8	12
5	19	10	11

4A. Six jobs are to be processed on 4 available machines. The following data is available about the processing time in hours for the jobs on different machines. Develop the best assignment using Index method. **(04)**

Job	Machines			
	A	B	C	D
1	15	14	20	22
2	13	16	17	13
3	9	12	14	16
4	16	22	15	20
5	10	13	14	14
6	14	16	17	18
Total time available	30	35	20	20

4B. The rate of demand for an item is 100 unit per week and the normal lead time is **(04)**

4 weeks. Calculate the SS and ROP for the following cases:

i. If SS is assumed to be 37% of LT consumption.
ii. If SS is assumed to be three weeks requirement.
iii. If SS is based on the LTmax., wherein the past record shows that the LTmax. has been 10.5 weeks.

4C. Identify whether the following statements are TRUE or FALSE **(02)**

i. Aggregate planning normally looks at the intermediate future.

ii.Changing inventory levels is a capacity option for generating an aggregate plan.

5A. Derive the equation for determining EOQ and total cost for Manufacturing Model without shortages with the sketch. **(05)**

5B. Product X is a zeroth level item. Component A is a first level item. 2 units of Y are needed in X. The item X has a lead time of 2 weeks. Y has a lead time of 1 week. Item X follows LFL and Y is purchased in order quantity of 600 units. At the beginning of first week of current schedule, 600 units of Y are scheduled to be received. In addition, 150 units of Y are available at the beginning of first week. 60 units are used as safety stock for Y. The independent demand for X and Y are as listed in the table for 6 weeks. Construct the MRP tables. **(03)**

Week	1	2	3	4	5	6
Product X	-	-	150	200	-	250
Product Y	80	80	50	50	100	80

5C. Define speculative and precautionary inventories. **(02)**