Name: **Enrolment No:**	UPES UNIVERSITY WITH A PURPOSE

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2019

Course : Manufacturing Logistics **Semester : II**
Program : MBA (LSCM) **Time : 03 Hours**
Course code: LSCM-7008 **Max. Marks: 100**
Instructions: Attempt questions from all sections as per instruction.

SECTION A (Marks 20)

			Marks	CO
Q 1	(i)	Mention two distinguishing features of Services 1……..2……	1	CO1
	(ii)	Name four methods of facility location models	2	CO2
	(iii)	Mention four types of manufacturing layouts	2	CO2
	(iv)	Accuracy of forecasting demand helps mainly in 1.....2….....	1	CO1
	(v)	Write four major impacts of inventory shortages	2	CO3
	(vi)	Reorder Level/Point calculated as ….	1	CO3
	(vii)	Safety Stock required when 1……. 2…….	1	CO3
	(viii)	Mention four materials handling equipment used in warehousing	2	CO3
	(ix)	Write two main objectives of packaging	1	CO3
	(x)	Write two advantages of Rail transportation	1	CO3
	(xi)	Write formula of Inventory turnover	1	CO4
	(xii)	Employee performance evaluation is used for 1……2…..	1	CO4
	(xiii)	Give two example of current assets.	1	CO4
	(xiv)	Working capital is generated from two main sources of	1	CO4
	(xv)	Mention four perspectives of Balanced Scorecard	2	CO5

SECTION B (5x4 = Marks 20)

Write short notes on any FOUR with examples (not more than 100 words)

<table>
<tr><td>Q 2</td><td>An Auto parts manufacturer is using assembly line to produce 160 units in 8 hours (one shift operation). Process element, Precedent and element process time is given.

<table>
<tr><th>Process Element</th><th>Precedence</th><th>Process Time (Minutes)</th></tr>
<tr><td>A</td><td>-</td><td>3</td></tr>
<tr><td>B</td><td>A</td><td>3</td></tr>
<tr><td>C</td><td>B</td><td>2</td></tr>
<tr><td>D</td><td>A</td><td>1</td></tr>
<tr><td>E</td><td>C, D</td><td>2</td></tr>
</table>

Calculate the desired cycle time and minimum no. of work station required to meet production targets,</td><td>5</td><td>CO2</td></tr>
<tr><td>Q 3</td><td>XYZ power plant required 600 tons of coal each day to produce electricity, and this tends to be fairly constant. The lead time for coal supply is normally distributed with a mean of 6 days and standard deviation of 2 days. A service level of 90% is desired. Find the Re-Order Point. (The value of Z corresponding to 90% service level is 1.28).</td><td>5</td><td>CO3</td></tr>
<tr><td>Q 4</td><td>Procurement Processes (or Cycle)</td><td>5</td><td>CO3</td></tr>
<tr><td>Q 5</td><td>Materials Transportation</td><td>5</td><td>CO3</td></tr>
<tr><td>Q 6</td><td>Warehouse Management system</td><td>5</td><td>CO3</td></tr>
<tr><td>Q 7</td><td>Supply Chain Balanced Scorecard with minimum two KPIs in each perspective.</td><td>5</td><td>CO5</td></tr>
</table>

SECTION-C (15x2=Marks 30)

Attempt any TWO questions. Explain with examples.

<table>
<tr><td>Q 8</td><td>Modern Power Ltd. want to setup a 500 MW power plant for which input raw material, coal to be supplied from three existing Coal Mines. The coordinates (in km) and coal supplies (‘000 MT) from these mines are provided in Table below. Management has identified two probable location of power plant, whose coordinates are also given. Using Load Distance model, find out the best location of the power plant.

<table>
<tr><th colspan="4">Coal Mines Coordinate (Km) and Supply (‘000 MT)</th></tr>
<tr><td>Coal Mines</td><td>X-Coordinate</td><td>Y-Coordinate</td><td>Coal Supply (‘000 MT)</td></tr>
<tr><td>M1</td><td>15</td><td>85</td><td>70</td></tr>
<tr><td>M2</td><td>45</td><td>110</td><td>40</td></tr>
<tr><td>M3</td><td>20</td><td>45</td><td>40</td></tr>
</table>
<table>
<tr><th colspan="3">Proposed Power Plant Location (km)</th></tr>
<tr><td>Power Plant Probable Location</td><td>X-Coordinate</td><td>Y-Coordinate</td></tr>
<tr><td>L1</td><td>30</td><td>60</td></tr>
<tr><td>L2</td><td>35</td><td>70</td></tr>
<tr><td></td><td></td><td></td></tr>
</table></td><td>15</td><td>CO2</td></tr>
</table>

<table>
<tr><td>Q 9</td><td>ABC Motor company is the manufacturer of a single model passenger car. Six months sales data from Oct 2018 to March 2019 is given below. Estimate the demand for next three months of April 2019 to June 2019 using Holt's Model (Trend corrected Exponential Smoothing) with $\alpha = 0.1$, $\beta = 0.2$. From Regression Analysis, the $L_0 = 97$ and $T_0 = 5.3$

<table><tr><th>Period</th><th>Month, Year</th><th>Actual Sales (no.)</th></tr><tr><td>1</td><td>10/2018</td><td>98</td></tr><tr><td>2</td><td>11/2018</td><td>106</td></tr><tr><td>3</td><td>12/2018</td><td>109</td></tr><tr><td>4</td><td>01/2019</td><td>133</td></tr><tr><td>5</td><td>02/2019</td><td>130</td></tr><tr><td>6</td><td>03/2019</td><td>116</td></tr></table></td><td>15</td><td>CO1</td></tr>
<tr><td>Q 10</td><td>What is aggregate production planning? Describe three basic strategies (Level, Chase and Mixed strategies) of aggregate production planning.</td><td>15</td><td>CO1</td></tr>
<tr><td colspan="4">SECTION-D (Marks 30)</td></tr>
<tr><td>Q 11</td><td colspan="3">Case Study
ABC Corp. is a major producer of agricultural and farm equipments. The firm was continuously going through the issues of ineffective and inefficient inventory management regarding its spares and components in alignment with demand. There were frequent instances of stockouts. The company sometimes ended up incurring larger expenses than required.

In May 2015, the management at A.B. Corp announced their decision to select a definite policy for purchasing and managing the inventory of various important spares and components, which were needed for fabricating, producing and assembling agricultural and farm equipments. The company and its management had gone through almost a year with a lot of mishandling and mismanagement to keep up with the maintenance of the inventory storage.

COMPANY BACKGROUND
ABC Corp. was one of the leading producers of agricultural and farm equipments in the Vidarbha region of Maharashtra. A-small sized manufacturer and distributor of locally produced spare parts and components; it largely catered to the price-sensitive rural population. The company owned and operated one small-sized manufacturing unit in a relatively small city, Gondia, in Vidarbha, an impoverished region in the most progressive state (Maharashtra) of India. ABC Corp. had an alliance partnership with Padgilwar Agro for the production of these agri-based tools and equipment.

ABC Corp's manufacturing units have been operational since 1996. In the year, 2012-13, the company reported annual sales of Rs. 4.2 million and employed more than 25 employees. Rather than competing with medium and large-scale operations prevalent in the industry, ABC Corp. preferred to zero-in on the rural segment. The company presented nearly 100 models of various appliances for farming, gardening, agriculture</td></tr>
</table>

and allied activities. The broad range of products was targeted at the rural population in adherence to ABC Corp's mission to cater to the population constituting the lower end of the market segment in and around the district.

ISSUES AT THE PURCHASING LEVELS

The central warehouse was catering to all the production centres, which manufactured a range of farm tools and equipments. The central warehouse purchased a variety of spares, materials, parts, subassemblies and components that were used in production, fabrication and assembling of the agricultural and farm equipments. Of late, there has been a surge in demand for finished goods, due to which ordering and managing inventory has become more cumbersome than it ever used to be. The central warehouse had a surplus supply of certain components; again they frequently faced stock-outs of some other spares and components. This created an impact on the production runs and very frequently, this was a major issue that was raised in the weekly production meeting. They also reported of increased cost of holding inventory. The purchasing manager was entrusted with the task of controlling the stock of items more efficiently and effectively. He re-negotiated the terms with TWO of his suppliers who agreed on a bulk discount proposal. They sent their final purchase proposals to the manager. He is now supposed to decide the order quantity such that the company may incur lowest possible total inventory cost for the year.

He was supposed to present his report in the next weekly meeting of all the functional heads. He aggregated all the data from his suppliers and got down to the task of making the process more organized and cost-saving.

Help the purchasing manager to decide on the quantity of components to be ordered and the reorder point of these components such that the cost of holding inventory in the central warehouse is minimum. Also how much saving would it entail given the fact that both suppliers are offering varying rates of discount on bulk orders?

THE PROBLEM VENDORS AND THE RIGHT MIX OF QUANTITY AND PRICE

The purchase manager was planning his ordering and inventory for the year. He faced the biggest issue of a typical inventory manager - 'how much to order'. The final agriculture equipments were prepared by using four primary spares and components for which they had already zeroed on two vendors viz. Vendor A and B. The ordering costs, annual carrying costs, and the unit costs of the items with different levels of quantity discount is given bolow in Exhibit 1

THE MEETING AND THE COURSE OF ACTION

The aim was to pick the right order size considering all the data available. The decision had to be taken by factoring in the various information like the bulk discounts available; cost of order, cost of holding, so as to minimize the total cost of purchase.

The Annual demand (nos.) 125000, annual holding cost is 40% of unit price and ordering cost Rs. 400/order.

EXHIBIT 1: Data available for four major spares and components

Vendor	QTY Range	Unit Price (INR)	Annual Demand	Cost per Order (INR)	Holding Cost (INR)
A	1-1999	20.9	125000	400	40%
	2000-3999	20.8			
	4000 and above	20.5			
B	1-1999	21.1	125000	400	40%
	2000-2999	21.0			
	3000-3999	20.9			
	4000 and above	20.8			

	(a) Calculate EOQ and minimum total cost for Vendor A.	15	CO3
	(b) Calculate EOQ and minimum total cost for Vendor B. Compare and select best vendor.	15	CO3

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Instructions: Attempt questions from all sections as per instruction.

SECTION A (10x2= Marks 20)

			Marks	CO
Q 1	(i)	Name four important factors considered for the warehouse location.	2	CO2
	(ii)	……method used for optimizing Process Layout while …….. ……..method used for optimising Product Layout.	2	CO2
	(iii)	Mention two reasons for using Fixed type layout.	1	CO2
	(iv)	Write formula of Tracking Signal in demand forecasting.	1	CO1
	(v)	Write four major objectives of inventory.	2	CO3
	(vi)	ABC inventory classification is based on ….	1	CO3
	(vii)	Write formulae of total cost for production lot size inventory model	1	CO3
	(viii)	Mention four materials handling equipment used in warehousing	2	CO3
	(ix)	Name four types of packaging materials used.	2	CO3
	(x)	Write two advantages of Ocean transportation.	1	CO3
	(xi)	Mention two types of employee performance evaluation.	1	CO4
	(xii)	Two main objectives of job rotation are…	1	CO4
	(xiii)	Give two example of current liability.	1	CO4
	(xiv)	Mention KPIs for customer perspective of Balanced Scorecard	1	CO5
	(xv)	Mention two distinct characteristics of Services.	1	CO1

SECTION B (5x4 = Marks 20)

Write short notes on any FOUR with examples (not more than 100 words)

<table>
<tr><td>Q 2</td><td>A RDC for FMCG goods to be located to supply to four dealers. The coordinates and the amount of material to be transported (Tons) annually to the dealers are given below. Determine the optimum location for the RDC using Median Model.

<table><tr><th colspan="4">Dealer</th></tr><tr><td>Dealer</td><td>X-Coordinate</td><td>Y-Coordinate</td><td>Load to be Transported (Tons)</td></tr><tr><td>D1</td><td>40</td><td>15</td><td>450</td></tr><tr><td>D2</td><td>10</td><td>30</td><td>1250</td></tr><tr><td>D3</td><td>25</td><td>35</td><td>805</td></tr><tr><td>D4</td><td>30</td><td>45</td><td>1550</td></tr></table></td><td>5</td><td>CO2</td></tr>
<tr><td>Q 3</td><td>A Type manufacturing company require rubber to manufacture car types. In the past quantity of rubber requirement has tended to vary normally with a mean of 25 Tons per day and standard deviation of 3 Tons per day. The Lead Time also vary and follows normal distribution with mean of 10 days and standard deviation of 2 days. What would be Re-Order Point to achieve Service level of 95%. (The value of Z for service level of 95% is 1.65 from Z table).</td><td>5</td><td>CO3</td></tr>
<tr><td>Q 4</td><td>Type of Warehouses.</td><td>5</td><td>CO3</td></tr>
<tr><td>Q 5</td><td>Materials Handling Equipments.</td><td>5</td><td>CO3</td></tr>
<tr><td>Q 6</td><td>IT application in Manufacturing.</td><td>5</td><td>CO5</td></tr>
<tr><td>Q 7</td><td>Mention 5 Performance measures for MM and Logistics each.</td><td>5</td><td>CO5</td></tr>
<tr><td colspan="4">SECTION-C (15x2=Marks 30)
Attempt any TWO questions. Explain with examples.</td></tr>
<tr><td>Q 8</td><td>A Briefcase manufacturer produces leather stylish handcrafted briefcase with care and attention. It require 6 primary work elements whose precedence and time taken given below. Working hours 40 per week and production required 80 units per week.
(i) Construct Precedence diagram.
(ii) Calculate desired cycle time.
(iii) Calculate minimum no. of work-stations required.
(iv) Balance the assembly line and calculate overall efficiency.
<table><tr><th colspan="2">Work Elements</th><th>Precedence</th><th>Time Taken (Minutes)</th></tr><tr><td>A</td><td>Tan Leather</td><td>-</td><td>25</td></tr><tr><td>B</td><td>Dye Leather</td><td>A</td><td>20</td></tr><tr><td>C</td><td>Shape case</td><td>B</td><td>15</td></tr><tr><td>D</td><td>Mold Hinges and Fixes</td><td>-</td><td>10</td></tr><tr><td>E</td><td>Install Hinges and Fixes</td><td>C, D</td><td>8</td></tr><tr><td>F</td><td>Assemble Brief Case</td><td>E</td><td>15</td></tr></table></td><td>15</td><td>CO2</td></tr>
</table>

<table>
<tr><td>Q 9</td><td>The monthly demand and forecast of chlorine for water treatment plant for a period of 6 months given below. Calculate MAD, MSE and Tracking Signal (TS). Interpret TS.

<table><tr><td>Period</td><td>Actual Demand</td><td>Forecast</td></tr><tr><td>1</td><td>70</td><td>97</td></tr><tr><td>2</td><td>130</td><td>113</td></tr><tr><td>3</td><td>170</td><td>134</td></tr><tr><td>4</td><td>150</td><td>158</td></tr><tr><td>5</td><td>165</td><td>177</td></tr><tr><td>6</td><td>190</td><td>195</td></tr></table></td><td>15</td><td>CO1</td></tr>
<tr><td>Q 10</td><td>The Rajesh Manufacturing Pvt. Ltd is a both producer and a user of brass couplings. The firm operates 220 days a year and uses the couplings at a steady rate of 50 per day. The couplings can be produced at rate of 200 per day. The machine setup cost is Rs 700 per run and annual storage cost of Rs 20 per coupling.
(i) Determine Economic Production Order.
(ii) Calculate no. of production runs per year.
(iii) Compute maximum inventory level.</td><td>15</td><td>CO3</td></tr>
<tr><td colspan="4">SECTION-D (10x3= Marks 30)</td></tr>
<tr><td>Q 11</td><td>India Auto Components: Facility Location Dilemma

India Auto Components Pvt. Ltd. (IAC) founded in 2000, is today counted among one of the renowned auto components manufacturers in South India. IAC focused on manufacturing equipment & electrical parts (brackets, washers, bolts, nuts, etc.) in SUV segment. IAC was setup by T N Shetty (Shetty) who was basically a technocrat for SUVs. Shetty, a graduate from IIT Chennai, joined Lucas TVS as Graduate Engineer Trainee in 1974 and worked his way up to be known as a successful Line Manager by 1985. As a Line Manager for more than 10 years Shetty acquired adequate knowledge in manufacturing auto components and during his tenure at Lucas TVS, at times he used to get defective lots from the suppliers. Shetty used to discuss with the suppliers and suggest solutions for the quality issues that surfaced.

Quite intrigued and emboldened by this, Shetty decided to start an auto components manufacturing company, which would be known for its premium quality and thus IAC was born in 2000. Before setting up the company, Shetty visited reputed manufacturing units across India (especially the three auto component clusters – Pune, Gurgaon and Chennai) which served him with valuable ideas for his proposed venture. Shetty decided to implement modern Japanese technology that would help him in achieving his mission of premium quality products, high productivity and rewarding business.</td><td></td><td></td></tr>
</table>

	He decided to start his venture with brackets manufacturing wherein his expertise was exemplary and gradually achieve his aim of being the major supplier to leading auto companies. After deciding on the venture, Shetty had to identify a location for setting up his manufacturing unit. In any industry, location of the manufacturing unit and /or warehouse plays a crucial role in improving efficiency and productivity. As Shetty had adequate experience and exposure in the field, he planned to consider various factors for 'importance' and zeroed in on two cities of the South Indian auto component manufacturing cluster (consisting of Chennai-Hosur-Bangalore-Coimbatore). The coordinates of two cities (Hosur and Coimbatore) identified are given in Annexure-I. Annexure-I: Prospective Cities and Their Coordinates **Proposed CITY Location** / **City Code** / **X-Coordinate** / **Y-Coordinate** Hosur / C1 / 55 / 70 Coimbatore / C2 / 60 / 55 Shetty was a strong believer in the concept, 'Success of a business also depends on facility location'. IAC decided to buy sub-components from three different suppliers. The location of the suppliers S1, S2 and S3 and the annual number of trailer loads (MT) that would be transported to the manufacturing unit were estimated by Shetty (Exhibit II). Exhibit II: Prospective Supplier and Estimated Demand Supplier / X-Coordinate / Y-Coordinate / Annual Number Trailor Loads ('00) S1 / 20 / 20 / 50 S2 / 30 / 50 / 80 S3 / 25 / 60 / 30		
	Shetty was in a dilemma about selecting the correct site. Suggest a location to construct a new manufacturing plant using Load Distance method.	30	CO2