

**PGDM (17-19)**  
**Logistics & Warehousing Management**  
**DM-442/IB-417**

**Trimester – IV, End-Term Examination: September 2018**

Time allowed: 2 hrs 30 min  
Max Marks: 50

Roll No: \_\_\_\_\_

**Instruction:** Students are required to write Roll No on every page of the question paper, writing anything except the Roll No will be treated as **Unfair Means**. In case of rough work please use answer sheet.

Sections	No. of Questions to attempt	Marks	Marks
A	3 out of 5 (Short Questions)	5 Marks each	$3 \times 5 = 15$
B	2 out of 3 (Long Questions)	10 Marks each	$2 \times 10 = 20$
C	Compulsory Case Study	15 Marks	15
		<b>Total Marks</b>	<b>50</b>

**SECTION A**

- A1 Analyze any latest trend in the logistics industry. How will the Indian logistics industry be affected by this trend? [5 Marks]
- A2 A Croma store sells a line of Bajaj Mixer Grinders in its electronics retail chain. Bajaj normally sells a Bajaj Mixer Grinder for a delivered price of \$85 per unit. A Croma store typically sells 6,000 units of Bajaj Mixer Grinders per year. A Croma store finds that carrying cost is 30 percent / year and the cost to prepare purchase orders is \$ 60 per order. Bajaj is offering to give a one-time \$ 6 discount off the regular price to reduce its plant inventory. Storeowner of a Croma store believes that Bajaj Mixer Grinders will continue to sell at the normal sales rate and any excess inventory created from a larger-than-normal purchase quantity will be depleted. Transportation cost is included in the price. [Note: Round up for whole units]
- i. How large should an order be placed with the Bajaj? [4 Marks]
- ii. If the special order is placed, how long will the order size need to be held in inventory? [1 Marks]
- A3 Why do we prefer shared storage system in the warehouse? What are the possible challenges in the implementation of a shared storage system? [5 Marks]



A4 A company imports parts from Taiwan through the Port of Seattle on the West Coast. The parts are destined for its assembly operations on the East Coast. Shipments are by rail and require 15 days transit time. The parts are worth \$ 225 each at the port, and 3000 of them are used annually in assembly operations. Inventory carrying costs are 40 percent per year. The rail rate to the East Coast is \$ 8 per 100 lb, and crated parts weigh 125 lb each. As an alternative, trucking can be used to cross the country in 7 days. Truck rates are \$ 10 per cwt. Do the savings from reduced in-transit inventories justify the higher cost of trucking? [Note: decimal fractions can be rounded off to the nearest value] [5 Marks]

A5 Ajanta produces a Gold- 2627 model of Musical Pendulum Clock. Product is currently packaged in single-wall corrugation. Through close observation, the firm has discovered that 1.00 percent of Gold- 2627 model is damaged between packaging and customer delivery. Ajanta can package Gold- 2627 model in double-wall corrugated fiberboard, which would reduce product damage by half. The current single-wall packaging costs \$0.50 per unit. The double wall packaging costs 20 percent more. The Gold- 2627 model has market value of \$100. Damaged units have salvage value of \$ 30. Ajanta sold 4,000 Gold- 2627 model last year. Forecasts indicate 10 percent increase in Gold- 2627 model sales over the next year. [Note: Round up for whole units lost]

From a least -cost perspective, should Ajanta utilize double wall corrugation with the Gold- 2627 model next year? [5 Marks]

### SECTION B

B1 Take the case of a new firm producing hi tech products, such as high-end mobile phones in a competitive dynamic mobile market. There are diversified channels of sale and product needs to be refreshed frequently. As a consultant, what would you suggest to this firm for achieving logistics competency? [10 Marks]

B2 Two items are jointly ordered from the same vendor. The data are as follows:

Particular	Item A	Item B
Demand Forecast	30	60
Error of the forecast	7	11
Lead time, days	15	15
Inventory Carrying cost, %/year	30	30
Procurement cost, dollar/order/item	20	20
Common procurement cost, dollar/order	50	
In-Stock Probability during order cycle time plus lead time	90%	95%
Product value, dollar/unit	150	100
Stock out cost, dollar/unit	15	20
Selling days per year	300	300

i. What is the maximum inventory level for each of these items? [6 Marks]



- ii. What is the average inventory level for item A? [2 Marks]
  - iii. What is the customer service level that can be expected for item A? [2 Marks]
- B3 D mart discount store stocks 5,000 packets of medicines per year. Purchases are made at an ordering cost of \$ 49 per order. Inventory carrying cost (I) is 20 percent per year. The price schedule, which includes the transportation cost, shows that order less than 999 packets will cost \$ 5 per packet; between 1000 to 1999 will cost \$ 4.80 per packet and 2,000 or more will cost \$4.75 per packet. Prices apply inclusively to all packets bought. What is the optimum purchase order size that should be placed, and what the total cost? [10 marks]  
*[Note: Round up for whole units]*

**SECTION C**

Ms. Sara has recently joined as an operations manager of Mondelēz International, Inc. She has to take several decisions related to transportation, warehousing, and inventory management in the organization. As a logistics consultant, you have to assist her in taking the best decisions. She is considering two trucking companies, namely Alpha and Beta for delivering its Toblerone chocolates from a company plant to one of its warehouse. The company is following EOQ model for shipping quantity of chocolate from company plant to warehouse. A reorder point control method of inventory control is used at the warehouse. Production planning and operations department estimated demand for the year that is 9,600 cwt./year. Other information are as follows:

- Order cost \$100/order,
- Product price \$50/cwt,
- Shipping quantity As per EOQ
- In-transit carrying cost 20% per year
- Inventory carrying cost 30% per year
- In stock probability during the lead time 90%
- Out of stock costs is unknown
- Selling days 365 per year

Information related to trucking service Alpha and Beta is as following:

	Services	
	Alpha	Beta
Transit Time (LT)	4 days	5 days
Variability (Standard deviation, $S_{LT}$ )	1.5 days	1.8 days
Rate	\$12 cwt.	\$11.80 cwt

As chocolates are perishable in nature, Ms. Sara also wishes to automate the warehouse so that material handling time and error in order picking rate can be minimized. She is considering full automation of the plant's warehouse. At present, the warehouse utilizes a mechanized system for material handling. Current system employs 15 labors at an average wage rate of \$14/hour. The cost of maintenance of the mechanized system is \$1500 per month and the company pays an annual rental of \$30,000 for the mechanized system. The mechanized system demand labors to work on machines for 5 hours per day. In a mechanized system, 1



percent of orders are damaged due to mishandling; therefore, plant scraps these 1 percent orders which result in loss of revenue of \$50 per cwt. Warehouse operates throughout the year except for 5 public holidays.

The automated equipment would annual rental cost \$ 50, 000. Only, 5 laborers and an automation specialist would be required to run the new system. The laborers would earn \$20/hour; laborers will work only for 4 hours per day on this new automated machine. Automation specialist would earn a fixed annual salary of \$45000. Maintenance for the automated system will cost around \$ 2500 per month. In an automated system, 0.75 percent of orders are damaged due to mishandling, therefore, plant reuse these 0.75 percent damaged orders, which result in loss of revenue of \$40 per cwt.

Further, in order to improve its supply chain function, Ms. Sara wants to buy inventory (raw materials) in a bigger lot to take advantage of quantity discount and follow cycle counts of inventory once a quarter instead of once a year. She also wants to treat holding cost as a constant amount instead of holding cost as a percentage of the unit price.

1. From the point of view of the inventory in the warehouse, which truck service should be selected? [6 Marks]
2. Considering demand and all costs depicted above, does mechanized system or the automated system represent the least total cost alternative? [6 Marks]
3. As a consultant, how will you explain to her about the trade-off involved in the decisions related to purchasing in a bigger size, implementing cycle counting (once a quarter) and treating holding cost as a constant amount? [3 Marks]

*[Note: decimal fractions can be rounded off to the nearest value]*



# Z-Chart & Loss Function

$F(Z)$  is the probability that a variable from a standard normal distribution will be less than or equal to  $Z$ , or alternately, the service level for a quantity ordered with a  $z$ -value of  $Z$ .

$L(Z)$  is the standard loss function, i.e. the expected number of lost sales as a fraction of the standard deviation. Hence, the lost sales =  $L(Z) \times \sigma_{\text{DEMAND}}$

Z	F(Z)	L(Z)	Z	F(Z)	L(Z)	Z	F(Z)	L(Z)	Z	F(Z)	L(Z)
3.00	0.0013	3.000	-1.48	0.0694	1.511	0.04	0.5160	0.379	1.56	0.9406	0.026
2.96	0.0015	2.960	-1.44	0.0749	1.474	0.08	0.5319	0.360	1.60	0.9452	0.023
2.92	0.0018	2.921	-1.40	0.0808	1.437	0.12	0.5478	0.342	1.64	0.9495	0.021
2.88	0.0020	2.881	-1.36	0.0869	1.400	0.16	0.5636	0.324	1.68	0.9535	0.019
2.84	0.0023	2.841	-1.32	0.0934	1.364	0.20	0.5793	0.307	1.72	0.9573	0.017
2.80	0.0026	2.801	-1.28	0.1003	1.327	0.24	0.5948	0.290	1.76	0.9608	0.016
2.76	0.0029	2.761	-1.24	0.1075	1.292	0.28	0.6103	0.274	1.80	0.9641	0.014
2.72	0.0033	2.721	-1.20	0.1151	1.256	0.32	0.6255	0.259	1.84	0.9671	0.013
2.68	0.0037	2.681	-1.16	0.1230	1.221	0.36	0.6406	0.245	1.88	0.9699	0.012
2.64	0.0041	2.641	-1.12	0.1314	1.186	0.40	0.6554	0.230	1.92	0.9726	0.010
2.60	0.0047	2.601	-1.08	0.1401	1.151	0.44	0.6700	0.217	1.96	0.9750	0.009
2.56	0.0052	2.562	-1.04	0.1492	1.117	0.48	0.6844	0.204	2.00	0.9772	0.008
2.52	0.0059	2.522	-1.00	0.1587	1.083	0.52	0.6985	0.192	2.04	0.9793	0.008
2.48	0.0066	2.482	-0.96	0.1685	1.050	0.56	0.7123	0.180	2.08	0.9812	0.007
2.44	0.0073	2.442	-0.92	0.1788	1.017	0.60	0.7257	0.169	2.12	0.9830	0.006
2.40	0.0082	2.403	-0.88	0.1894	0.984	0.64	0.7389	0.158	2.16	0.9846	0.005
2.36	0.0091	2.363	-0.84	0.2005	0.952	0.68	0.7517	0.148	2.20	0.9861	0.005
2.32	0.0102	2.323	-0.80	0.2119	0.920	0.72	0.7642	0.138	2.24	0.9875	0.004
2.28	0.0113	2.284	-0.76	0.2236	0.889	0.76	0.7764	0.129	2.28	0.9887	0.004
2.24	0.0125	2.244	-0.72	0.2358	0.858	0.80	0.7881	0.120	2.32	0.9898	0.003
2.20	0.0139	2.205	-0.68	0.2483	0.828	0.84	0.7995	0.112	2.36	0.9909	0.003
2.16	0.0154	2.165	-0.64	0.2611	0.798	0.88	0.8106	0.104	2.40	0.9918	0.003
2.12	0.0170	2.126	-0.60	0.2743	0.769	0.92	0.8212	0.097	2.44	0.9927	0.002
2.08	0.0188	2.087	-0.56	0.2877	0.740	0.96	0.8315	0.090	2.48	0.9934	0.002
2.04	0.0207	2.048	-0.52	0.3015	0.712	1.00	0.8413	0.083	2.52	0.9941	0.002
2.00	0.0228	2.008	-0.48	0.3156	0.684	1.04	0.8508	0.077	2.56	0.9948	0.002
1.96	0.0250	1.969	-0.44	0.3300	0.657	1.08	0.8599	0.071	2.60	0.9953	0.001
1.92	0.0274	1.930	-0.40	0.3446	0.630	1.12	0.8686	0.066	2.64	0.9959	0.001
1.88	0.0301	1.892	-0.36	0.3594	0.605	1.16	0.8770	0.061	2.68	0.9963	0.001
1.84	0.0329	1.853	-0.32	0.3745	0.579	1.20	0.8849	0.056	2.72	0.9967	0.001
1.80	0.0359	1.814	-0.28	0.3897	0.554	1.24	0.8925	0.052	2.76	0.9971	0.001
1.76	0.0392	1.776	-0.24	0.4052	0.530	1.28	0.8997	0.047	2.80	0.9974	0.001
1.72	0.0427	1.737	-0.20	0.4207	0.507	1.32	0.9066	0.044	2.84	0.9977	0.001
1.68	0.0465	1.699	-0.16	0.4364	0.484	1.36	0.9131	0.040	2.88	0.9980	0.001
1.64	0.0505	1.661	-0.12	0.4522	0.462	1.40	0.9192	0.037	2.92	0.9982	0.001
1.60	0.0548	1.623	-0.08	0.4681	0.440	1.44	0.9251	0.034	2.96	0.9985	0.000
1.56	0.0594	1.586	-0.04	0.4840	0.419	1.48	0.9306	0.031	3.00	0.9987	0.000
1.52	0.0643	1.548	0.00	0.5000	0.399	1.52	0.9357	0.028			

Z & L(z) for special service levels

Service Level F(z)	z	L(z)
75%	0.67	0.150
90%	1.28	0.047
95%	1.64	0.021
99%	2.33	0.003

