

PGDM, 17-19

Supply Chain Management (DM-404)

Trimester-IV, End Term Examination, September 2018

Time allowed: 2 hr 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.

Section A: Short answer questions (Five marks each. Attempt any three; total marks 15)

- A1. In the pre-GST regime, companies had stocking facilities in every state they did business in because there was no VAT charged on stock transfers. This resulted in a complex logistics network. With the advent of GST, companies are no longer forced (or incentivized) to maintain stocking facilities in every state. In what ways has the present tax regime impacted the logistical drivers (facility, inventory, transportation) of the supply chains of these companies?
- A2. State three ways in which you will reduce the impact of bull whip effect in a supply chain.
- A3. Compare make-to-stock (MTS) strategy with configure-to-order (CTO) strategy. What demand conditions suit each of these? Therefore, state the merits and demerits of each strategy.
- A4. Total logistics costs are the sum of inventory, transportation, and facility costs for a supply chain network. How does the transportation cost change as the number of facilities increases? Explain.
- A5. In the single period inventory model the retailer orders a quantity that maximizes its expected profitability. What does this order quantity depend upon? How can this order quantity be increased?

Section B: 10 marks each. Attempt any 2; total marks 20

- B1. A regional warehouse purchases hand tools from various suppliers and then distributes them on demand to retailers in the region. The warehouse operates 5 days a week, 52 weeks in the year. The following data are given for one product, namely the 1-inch drill:

Average daily demand = 100 drills

Standard deviation of daily demand = 30 drills

Supplier lead time = 3 days

Holding cost = Rs.9.40 per unit per year

Ordering cost = Rs.35 per order
Service level = 95 per cent

- a. Devise an inventory policy for this product (how much to order, and when). Assume continuous review. (3 + 4 marks)
- b. The finance department has instructed the warehouse to reduce the average inventory by half, without compromising on availability. What are the options available to the warehouse manager (just list the options)? (3 marks)

B2. Summer is high season for tourism in Jaipur: tens of thousands of tourists visit the city's historical landmarks. Many visitors take guided tours around these locations. Many of these guided tours make a stop at the Amer Palace. The thousands of tourists that stop here every summer, usually thirsty, are a great market for cold bottled water. A local store based next to the Palace takes advantage of this opportunity by placing dozens of water bottles in huge blue buckets with ice in the shade, within sight of the tourists. The colder the water bottles are, the better they sell. It takes usually several hours to chill the bottles, so the decision of how many bottles to prepare for sale is taken the previous day.

You have been asked by the store to help them calculate the number of water bottles they should chill and stock in the ice buckets, ready to sell to tourists each day. Based on historical data, you have determined the daily demand for bottled water during the summer is – on average – normally distributed with a mean of 400 bottles, and a standard deviation of 100 bottles. The store buys the water bottles at Rs.5.50 a piece, and spends an additional Rs.1.00 in electricity and ice to chill it and keep it that way. A chilled bottle is sold to the tourists at Rs.10.00 a piece. Since the labels of the bottles deteriorate under water, the bottles that do not sell at the end of the day have to be discarded.

- a. What are the values of the shortage (underage) cost, excess (overage) cost, and the critical ratio? (3 marks)
- b. How many water bottles should the store prepare for sale every day? Round to the closest multiple of 10. (2 marks)
- c. The store's owner is concerned that your recommendation calls for stocking much less water than he is used to. He is convinced that for every person that doesn't get to buy water (because of shortage), the store loses an additional amount of Rs.5.00 worth of profit from sales in snacks and other things these people would have bought. Using Rs.5.00 as an additional penalty per lost sale, what is the new critical ratio? (3 marks)
- d. Based on the value calculated in question (c), how many water bottles should the store prepare for sale every day? Round to the closest multiple of 10. (2 marks)

B3. Consider the end-to-end supply chain for blood. Blood is sourced from humans, either at donation camps organized by NGOs like the Red Cross, or at blood banks in

hospitals on a need basis. There are eight different blood groups (types). The collected blood is first tested and then processed to extract three products – RBC, platelets, and plasma. Each of these components has specific storage requirements (temperature) and has limited shelf life. Consumption of these components for transfusion is geographically highly distributed (at various hospitals and medical centres). Even at a specific medical centre, the requirement of a specific type (or group) can vary significantly from day to day.

- a. Supply chain surplus is defined as the difference between customer value and supply chain costs.
 - i. How will you characterize customer value in this case? (2 marks)
 - ii. What would constitute the supply chain costs (remember, most blood donors do not charge any money for donating blood)? (3 marks)
- b. On the efficiency-responsiveness continuum, where will you position the blood supply chain? Give reasons. (2 marks)
- c. Many hospitals have their own blood banks. Considering the implied uncertainty in the demand, however, very often donors of specific blood types need to be mobilized on an urgent basis, or blood products need to be sourced from some other nearby blood bank. On the other hand, equally often, blood products also get discarded due to expiry. If, however, the blood was stored in a centralized facility, catering to a number of nearby hospitals and medical centres, the problems of stockouts and excess inventory could be better managed. Do you agree? Please explain giving reasons. (3 marks)

Section C: Case study; 15 marks

Penang Electronics (PE) is a contract manufacturer that produces and packages private-label products for several retail chains, including Target, Best Buy, Staples, and Office Max. In each case, the basic products are identical, with the only difference being the labelling and packaging. Thus, the labelled and packaged version of the product destined for Target, for example, cannot be sent to Best Buy.

Currently all products are manufactured, labelled, and packed at a production facility in Penang (Malaysia). This facility replenishes a DC in St. Louis (in the USA), from which all customer orders are filled. The manufacturing and transportation lead time from Penang to St. Louis is nine weeks. PE uses a continuous review policy to manage inventories at its DC and aims to provide a cycle service level of 95 percent for each product.

The previous month had been very challenging because Best Buy requested 5000 additional units beyond what was available at the DC, whereas Target ordered 3500 fewer units and Staples ordered 4000 fewer units. Thus, even though there was sufficient product availability

(since the basic product was the same), PE could not meet the Best Buy request because the excess inventory available was labelled and packed for other customers. PE had faced shortage as well as excess stock of a single unit at the same time.

The vice president of supply chain at PE proposed postponing the final labelling and packing operations to the DC at St. Louis. Her logic was that this would allow PE to use all available inventories to serve any customer. In particular, the situation that arose last month could have been avoided through postponement. If labelling and packaging was shifted to St. Louis, the lead time of acquiring the basic product from Penang would continue to be nine weeks.

The DC management, however, was opposed to this idea because it would add additional work that was very different from what they had done so far. A detailed study had shown that labelling and packing at St. Louis would cost \$1.50 per unit more than what it cost at Penang. The DC management believed that this move would unnecessarily complicate the DC operations and could adversely affect customer service.

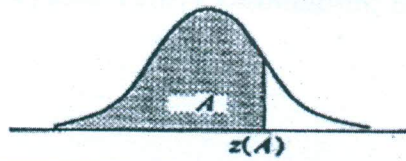
To evaluate the two options, a team from both manufacturing and the DC was set up. The team decided to focus its analysis on two major product categories – computers, and printers; and three major customers – Target, Best Buy, and Office Max. The weekly demand data for each product and customer are shown in the table below. All demands are normally distributed. PE incurred a total cost of \$1000 per computer, and \$300 per printer. Given the short life cycles of these products, PE used an annual holding cost of 30 percent when making its inventory decisions. The team analysed the impact of postponement on safety inventories before making a final recommendation.

	Computers		Printers	
	Mean	SD	Mean	SD
Target	1000	700	2000	1000
Best Buy	700	600	1500	800
Office Max	800	600	1200	600

Answer the following questions. Wherever possible, please be brief. Each part carries three marks.

1. What do you think is/are the problem(s) faced by PE's supply chain at present? You may wish to consider the concept of supply chain surplus (or that of responsiveness vs. efficiency) in answering this question.
2. In what way will the proposed postponement address the problem(s) identified by you? Give your reason.
3. What is the annual cost of holding safety inventory at the St. Louis DC at present?
4. What is the comparable annual cost if the proposed postponement is carried out? Should PE go ahead with the proposal?
5. How should PE convince the DC management if it decides to implement the proposal?

Entry is area A under the standard normal curve from $-\infty$ to $z(A)$



z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
.1	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
.4	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879
.5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224
.6	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
.9	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.9279	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
1.8	.9641	.9649	.9656	.9664	.9671	.9678	.9686	.9693	.9699	.9706
1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990
3.1	.9990	.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9993	.9993
3.2	.9993	.9993	.9994	.9994	.9994	.9994	.9994	.9995	.9995	.9995
3.3	.9995	.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9996	.9997
3.4	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9998