

**BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI**

**FIRST SEMESTER- 2022-2023**

**MM ZG 621 SUPPLY CHAIN ANALYTICS**

**Comprehensive EXAM - OPEN BOOK**

**Max. Marks: 40**

**Date: 28/12/22**

**Time: 2.5 Hrs.**

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**Q.1** Assume Sony is to manufacture 27 PCs with three distinct components: C1, C2 and C3. Under the disaggregate option, Sony designs each component for each PC resulting into 81 components. Under common components option, Sony designs such that with three distinct C1, C2 and C3 can be combined to create 27 different PCs. Monthly demand of each of the 27 PCs is independent and normally distributed with a mean of 5000 and S.D of 3000. The replenishment lead time for each component is one month. Assume desired CSL of 95% for component inventory. Evaluate safety inventory requirements with and without use of common component community. ( $Z @ 95\% = 1.64$ ) **( 3 Marks)**

**Q.2** Weekly demand for Nokia cell phones at a Best buy store is normally distributed with a mean of 300 per month and S.D. of 200 per month. The order placement and order receipt and update cost is Rs 4000 per order and inventory holding cost is 20 percent of each cell phone's cost. Cell phone costs varies from 20,000 to 50,000 per unit. Nokia takes two weeks to supply Best buy order. Best buy is targeting CSL of 95 % and has continuous monitoring policy. How much safety inventory should Best buy should carry? What should be its ROP? What is the average inventory in this case particular case? **(4 Marks)**

**Q.3** Flextrola, Inc., an electronics system integrator, is planning to design a key component for their next generation product with Solectrics. Flextrola will integrate the component with some software and then sell it to consumers. Given the short life cycles of such products and longtime quote by Solectrics, Flextrola has the only one opportunity to place an order with Solectrics prior to the beginning of the selling season. Flextrola's demand during the selling season is normally distributed with a mean of 1,000 and S. D. of 600.

Solectrics production cost for the component is \$52 per unit and it plans to sell the component for \$72 per unit to Flextrola. Flextrola incurs essentially no cost associated with the software integration and handling of each unit. Flextrola sells these units to consumers for \$121 each. The company can sell the unsold inventories at the end of season in the secondary electronics market for \$50 each. The existing contract specifies that once the Flextrola places the order, no changes are allowed to it. Also Soloetircs does not accept any returns of unsold inventory.

- a) What is the probability that Flextrola's demand will be within 25 percent of its forecasts? (2)
- b) Under this contract, how many units should Flextrola order to maximize its expected profit? (2)

Assume that Flextrola orders 1200 units, then

- c) What are the Flextrola's expected sales? (2)
- d) how many units of inventory can Flextrola expect to sell in the secondary electronics market? (2)
- e) What is the Flextrola's expected gross margin percentage? (3)
- f) What is the Flextrola's expected profit? (2)
- g) What is the Solelectrics's expected profit? (2)
- h) What is the probability that Flextrola's has lost sales of 400 units or more? (2)
- i) What would be the mismatch cost for Flextrola (3)

Xandova electronics (XE) approached the Flextrola with the possibility of also supplying this component. XE's main value proposition is that they offer 100 percent fill rate and one-day delivery on all of the Flextrola's order, no matter when the order is submitted. Flextrola promises its consumers a one week lead time, so one-day day lead time from XE would allow Flextrola to operate with make to order production. (The software integration that Flextrola performs can be done within one day). The XE's prices is \$ 83.50 per unit.

- j) Suppose Flextrola were to procure exclusively from XE, what would be order quantity and expected profit? (2)
- k) what would be Flextrola's expected profit if procures from both solelectrics and XE, Flextrola will order some amount from Solelectrics before the season and then procure from XE during the season to fill the demand that exceed the order quantity. (2)
- l) Concerned about the potential loss of business, Solelectrics is willing to renegotiate their offer. Solelectrics now offers Flextrola an option contract. Before the season starts, Flextrola purchases the Q options and pays Solelectrics \$25 per option. During the selling season, Flextrola can exercise upto purchased Q options with one-day lead time - that is Solelectrics delivers on each exercised option within one day and the exercise price is \$50 unit. If Flextrola wishes to purchase extra units beyond the option purchased, Solelectrics will deliver units at XE's price, \$ 83.50 unit. How many options should Flextrola purchase from Solctrics? (4)

**Q.4 a)** Bangalore based retail company owns two outlets- one in an up market mall and other a discount store in Chennai. It has procured 2,000 quantities of a new toy at a unit cost of Rs 300 from China for the Christmas season. The retailer plans to sell the toy at Rs 500 at the discount store and at Rs 800 in the up market mall during the Christmas season. The retailer knows that at the discount retailer there is unlimited demand for this new toy but demand for new toy at the up market mall is likely to be normally distributed with a mean of 600 and S. D. of 200. As per customer policy, all the leftover toys at the end of Christmas season will be donated to charity.

a) Suppose company relied exclusively on discount market, what would be the company's expected profit? **(2)**

c) How many toys should the retailer reserve for the up market mall retail outlet if company decides to sell through both markets. **(3)**