Name:

Enrolment No:

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Term Examination, December 2024

Course: Supply Chain Modelling, Design and Simulation **Semester: III**
Program: MBA (Logistics and Supply Chain Management) **Time: 03 hrs.**
Course code: LSCM8006 **Max. Marks: 100**

Instructions: A simple calculator is allowed inside the exam. Hall.

SECTION A
10Qx2M=20Marks

1. Instruction: Select the correct answer(s)/answer.

S. No.	Question	Marks	CO
Q1.1	The goal of supply chain master planning is to: a) Decide how to utilize resources effectively b) Address fundamental trade-offs in the supply chain c) Neither A nor B d) Both A and B	2	CO1
Q1.2	When assessing network configuration, optimization models should incorporate which of the features below? a) Supplier location b) Warehouse-to-warehouse flow c) Accessibility of raw materials d) All the above	2	CO1
Q1.3	Which of the following is not a network planning process step? a) Network design b) Determining sourcing requirements c) Inventory positioning d) Resource allocation	2	CO1
Q1.4	Which of the below is not a principle of forecasting. a) Forecasts are always reliable. b) The forecast is always wrong. c) The longer the forecast horizon, the worse the forecast. d) Aggregate forecasts are more accurate.	2	CO1
Q1.5	Inventory may consist of: a) Components. b) Work in process. c) Finished product. d) All the above.	2	CO1
Q1.6	Which key issue in supply chain management deals specifically with relationships between suppliers and buyers? a) Distribution strategies. b) Supply contracts c) Supply chain integration and strategic partnering. d) Customer value	2	CO1
Q1.7	In procurement, what does the term "Total Cost of Ownership" (TCO) encompass? a) Only the purchase price of the product	2	CO1

	b) All costs associated with acquiring, owning, and maintaining a product c) Costs related to supplier selection d) d) Transportation costs only		
Q1.8	Network planning consists of all the following elements except: a) Finding the right balance between inventory, transportation, and manufacturing costs b) Match supply and demand under uncertainty by positioning and managing inventory effectively. c) Utilize resources effectively by sourcing products from the most appropriate manufacturing facility. d) These are all parts of network planning.	2	CO1
Q1.9	In supply chain simulation, what does "what-if analysis" involve? a) Simulating scenarios and assessing the impacts of different variables b) Analysing historical supply chain data c) Ignoring potential disruptions d) d) Exclusively focusing on cost reduction	2	CO1
Q1.10	In supply chain simulation, what is the primary purpose of using "sensitivity analysis"? a) Identifying optimal solutions b) Automating supply chain processes c) Evaluating the impact of parameter variations on model outcomes d) Minimizing the importance of supply chain disruptions	2	CO1
SECTION B (4X5=20 MARKS) *Question 2. Answer the below questions (2.1, 2.2, 2.3 & 2.4) in your own words (max. up to 200 words each) based on the case content below.*			
Q2.1	Explain the regression method (time series data) of forecasting in your own words.	5	CO2
Q2.2	Give example of risk pooling: a. Across locations b. Across time c. Across products	5	CO2
Q2.3	What is the difference between using an exact optimization technique and a heuristic algorithm to solve a problem?	5	CO2
Q2.4	What is simulation and how does it help solve difficult logistics problems?	5	CO2
SECTION C (10X3= 30 MARKS)			

Question 3: Answer the questions below (3,1, 3.2 & 3.3) in your own words (max. up to 500 words each) based on the case content and your own knowledge.

Case-let:

Whether it's a truck, a tsunami, or an economic downturn, the same general rule applies: You're better off if you can see it coming from a safe distance.

There aren't many companies that understand this notion better than Cisco Systems Inc. White-hot during the 1990s, the company was pummelled after its vaunted inventory forecasting system could not—or did not—predict the dot-com bubble's collapse. The result of this miscalculation was that sales were halved, the company lost 25 percent of its customers in a matter of weeks, and it ultimately wrote off more than $2 billion in inventory. After that experience, Cisco's supply chain team vowed that it would never get blindsided again.

"There is a huge difference cutting head count between now and 2001," says Karl Braitberg, Cisco's vice president of customer value chain management. Back then, Cisco's supply chain model was built on a "push" system, where products were made, and inventory was built up in anticipation of market demand based on best-guess forecasts. "Then, when demand dropped, the supply chain froze. Nothing happened," Braitberg says. "We knew we had to build a new system that reacts better than just 'push.'"

Every company is tasked with matching its supply to consumer demand. In a normal business cycle, how well that job is accomplished determines whether the company is profitable. But this current economic downturn is anything but normal, and businesses are struggling to simply stay liquid. There are various strategies to help preserve working capital, including cutting head count, outlets, and manufacturing lines. But for most companies, the key to capital preservation will be how well they can reduce their inventory levels.

Largely, companies are in survival mode, and they're looking to their supply chain management team to free up precious capital to help them do that. While it may not fall directly on IT executives to make that happen, their role in the equation is very strategic. With globalization, outsourcing, and increased compliance and security concerns, managing supply chain operations becomes increasingly complex. And shorter, more frequent product cycles targeting more-sophisticated markets create a need to manage more products and parts from remote locations. Add the pressure of shorter cash-to-cash cycles—the time from when a business extends credit to build inventory until the time it gets paid—into the equation, and the need for an intelligent, nimble, and timely flow of information becomes critical.

To have visibility as well as command and control, supply chain operations must be tightly integrated with the IT infrastructure. That isn't the case at many companies, and yet it may be the factor that determines success or failure as they endure and emerge from this downturn. Like bloodletting, reducing inventory is a delicate matter that most people would prefer to avoid. Inventory can range from materials, to parts, to fully assembled products. Nobody wants to run out. If there's too little, customers won't get orders in a timely manner and market opportunities will be missed. Yet if a company carries too much and demand drops, then the inventory must be "bled down," or reduced in price, until it has a buyer.

During a strong economy and when cash flow is loosened, many companies can get by without rigorous inventory management practices, says Larry Lapide, director of demand

management at the MIT Center for Transportation & Logistics in Cambridge, Massachusetts. But during a recession, he adds, "companies had better bleed down inventory to reflect the downturn in sales. If they don't, it just sits there."

Inventory optimization is so critical now because of its impact on available cash, Lapide says. In accounting terms, inventory is an asset. So, inventory that is on the books through manufacturing, assembly, and distribution represents credit-funded inventory. With credit at a premium, it's in a company's best interest not only to keep inventory levels tight, but also to sell goods as soon as possible.

Reducing costs and squeezing maximum utility out of fixed assets is nothing new to Black & Decker Corp.'s Hardware and Home Improvement Group in Lake Forest, California. The unit supplies hardware to big-box retailers that have responded to the economic downturn with new low-price strategies. It now falls on Scott Strickland, vice president of IS, to help the group squeeze down its own costs and maintain profit margins. "We had been loath to drive inventory down to this level," Strickland says.

However, the company had gained invaluable experience by deploying an integrated inventory management system prior to the downturn. The result was that the key decision makers throughout its supply chain were operating with the same information, planners focused only on exceptions, and supplier and material issues were quickly resolved. The system, Strickland says, does the heavy lifting, and as a result, the unit has cut planning cycles from weeks to days and improved forecast accuracy by 10.4 percent.

"If someone had told us nine months ago that we could lower inventory as fast as we could to address a sales decline, we would not have believed it was possible," Strickland says. However, "because of the impetus on freeing up working capital, we have been focused on lowering our inventory and levels. We figured we could do this, and it turned out to not be the bad experience we had imagined." The effort to lower inventory levels to free up working capital has proved so effective that the Black & Decker unit and its partners are jointly considering making it standard practice even after the economy recovers, Strickland says.

O'Reilly Auto Parts Inc. in Springfield, Missouri, uses inventory as a competitive differentiator, says Greg Beck, vice president of purchasing. One of the largest specialty retailers of automotive aftermarket parts, tools, supplies, and accessories in the United States, O'Reilly is responding to the recession differently than many other companies. "Business is increasing because of the downturn," Beck says. "People aren't buying new cars but instead are putting more money into fixing old cars."

This isn't to say that O'Reilly lacks supply chain challenges or that it can let down its guard. As the result of an acquisition last year, the company increased its total store count to more than 3,300 and now operates in 38 states. To bolster its competitive advantage, O'Reilly's strategy is to increase customer service levels and replenish inventory on a nightly basis, while at the same time managing an increasing number of products.

The partnership between the supply chain operation and IT was critical to O'Reilly's strategy. The company is using Manhattan Associates Inc.'s replenishment software to collect product data information on the half-hour, while updates from the distribution centres are transmitted nightly. The replenishment system uses this data to determine the forecast for these products.

As a result, O'Reilly has increased inventory turns by 44 percent, and it still manages to fulfill 97 percent of customer requests immediately, with 3 percent handled through separate channels. At the same time, the company reduced its inventory levels, freeing up $60 million.

Companies say that driving costs out of the supply chain is an important goal, but the big question is whether—especially during a recession—they can afford to invest in their supply chain IT infrastructures to help make that happen. Dwight Klappich, an analyst at Gartner Inc., calls that a short-sighted and, in the long term, costly approach. "If this trend continues," Klappich stated in a report, "this myopic focus on short-term tactical issues, while necessary for many businesses, could widen the gap between the best-performing organizations and lower-performing organizations."

Cisco understands this. After the 2001 downturn, it made major system investments to transform its "push-driven," siloed supply chain model into an integrated "pull system" that can extract timely data from suppliers and downstream partners. This reorder data is sent to Cisco after being triggered by specified parameters and algorithms, to shape "demand signals." The system doesn't operate in a vacuum. Cisco has optimized its forecasting algorithms by bringing together representatives from its marketing, finance, sales, supply chain, and IT departments, and from key customers. As part of its sales and operations planning process, this group collaborates to create a common view of demand signals. This input drives an agreed-upon plan of action to align manufacturing capacity and inventory deployment and meet customer service levels. In short, they work together with the same data to optimally match supply and demand. "Now, if there are no pull signals, nothing gets brought into the system," says Cisco's Braitberg.

Manufacturers don't continue to source and build inventory that may sit in some warehouse waiting for customers who may never buy it. Cash is freed up for other purposes. While Braitberg acknowledges that even past history can't be used as a template for this downturn, Cisco is confident that it has better visibility into market demand when it goes down, and that it will be ready when the green shoots emerge. "We now have the techniques in place to be hypersensitive to demand changes," Braitberg says, "and we can manage our way through a downturn.".

Q3.1	Cisco Systems went from a "push" to a "pull" approach to its supply chain after the dot-com debacle. How are these two approaches different? Does it depend on the state of the economy which one should be used? Why?	10	CO3
Q3.2	What are the different elements that need to come together to bring supply chains to the optimal levels needed by these companies? What role does IT play?	10	CO3
Q3.3	How are the approaches to inventory management taken by O'Reilly Auto Parts, on one hand, and Cisco Systems and Black & Decker, on the other, different?	10	CO3
SECTION D (15X2= 30 MARKS)			

Question 4: Answer the below questions in your own words (max. up to 700 words each).			
Q4.1	Explain how each of the following helps to alleviate the bull-whip effect: a. E-commerce and internet b. Collaborative forecasts c. Everyday low pricing d. Vendor managed inventory e. Supply contracts	15	CO3
Q4.2	Doon Electronics (DoonE) is a manufacturer of electronic equipment. The company has a single manufacturing facility at Dehradun. It distributes its products from factory through five regional warehouses located at Delhi, Mumbai, Kolkata, Chennai and Bhopal. Customer, typically retail outlets receive items directly from their assigned market area's respective regional warehouse. Typically, it takes about 2 weeks, to satisfy an order placed by any of the regional warehouses. To improve service levels and reduce costs, DoonE would like to consider an alternate distribution strategy in which the five reginal warehouses are replaced by a single, central warehouse that will be in charge of all customer orders. a. Provide an outline of an analysis of new logistics network design consisting of only a single warehouse. e.g., what are the main steps? What data would you need? b. Also compare both the strategy/approaches?	15	CO3