Enrollment No./Seat No.:

GUJARAT TECHNOLOGICAL UNIVERSITY

MBA - SEMESTER - II EXAMINATION - WINTER 2025

Subject Code: 4529205 **Date: 21-01-2026**

Subject Name: Production & Operations Management

Time: 02:30 PM TO 05:30 PM **Total Marks: 70**

Instructions

1. Attempt all questions.

2. Make suitable assumptions wherever necessary.

3. Figures to the right indicate full marks.

4. USE of SIMPLE calculators AND non-programmable scientific calculators are permitted.

			Marks
Q.1		ALL 7 Questions must be Compulsory.	**14**
	(a)	Batch manufacturing	
	(b)	Six Sigma	
	(c)	Critical Path	
	(d)	Sequencing	
	(e)	Economic Order Quantity	
	(f)	TQM	
	(g)	Robust Design	
Q.2	**(a)**	Explain the Factors affecting Facility Location Planning.	**07**
	(b)	What are the routing, dispatching, prioritization and expediting? Explain.	**07**
		OR	
	(b)	Discuss the scope of production and operations management.	**07**
Q.3	**(a)**	What is Master Production Schedule? Discuss the objectives and functions of it.	**07**
	(b)	Discuss any three Inventory Management methods used in manufacturing units.	**07**
		OR	
	(a)	Define Aggregate Production Planning. Discuss various strategies of Aggregate Production Planning.	**07**
	(b)	What do you understand by Quality? Discuss various Quality dimensions for Food and beverages Industry.	**07**
Q.4	**(a)**	What is ISO certification series? Discuss.	**07**

(b) Consider a single-server queuing system (M/M/1) at a service counter. Customers arrive according to a Poisson process at an average rate of 12 customers per hour (λ = 12/hr) and the service times are exponentially distributed with an average service rate of 15 customers per hour (μ = 15/hr). Answer the following (show all workings): **07**

1. Calculate the server utilization (ρ).
2. Find the probability that the system is empty (P0).
3. Compute the average number of customers in the system (L).
4. Compute the average number of customers in the queue (Lq).
5. Find the average time a customer spends in the system (W) and the average waiting time in the queue (Wq).
6. What is the probability that there are more than 3 customers in the system? Also state the probability that an arriving customer has to wait.

OR

(a) What is Industrial Safety? What are the steps to be taken to prevent accidents in any organization? **07**

(b) A software development team is planning the release of a new feature. The following activities, their dependencies, and estimated duration in weeks are provided: **07**

Activity	Predecessor(s)	Duration (Weeks)
A	-	5
B	-	4
C	A	6
D	A	3
E	B, C	7
F	D, E	2

You are required to solve this problem using the Activity-on-Arrow (AOA) Network Diagram convention:

1. Draw the Project Network Diagram using AOA.
2. Calculate the Earliest Start (ES), Earliest Finish (EF), Latest Start (LS), Latest Finish (LF), and Total Slack (TS) for every activity.
3. Identify the Critical Path.

Q.5 **Case Study: Mumbai Dabbawala and the Six Sigma Standard**

The Mumbai Dabbawala system is one of the most attractive examples of supply chain and service excellence in the world. Every working day in Mumbai, nearly 5,000 dabbawalas (lunchbox delivery men) deliver over 200,000 tiffin boxes from homes to offices and back. This highly efficient service has been operating for over a century and has become an inspiration for business leaders, researchers, and management professionals worldwide.

The Dabbawala Model:

The core task of the dabbawalas is simple: pick up home-cooked food from customers' residences in the morning, deliver it to the correct office by lunchtime, and return the empty tiffin to the home in the evening. However, the challenge lies in executing this operation across one of the world's most crowded cities with unpredictable weather, heavy traffic, and an overstressed transport system.

Despite these challenges, the system is incredibly reliable and accurate, with an error rate so low that international business schools have compared it to Six Sigma standards. Six Sigma, as a concept, represents 3.4 defects per million opportunities, or 99.99966% accuracy. In the case of the dabbawalas, research conducted by Harvard Business Review and Forbes suggested that their error rate is about 1 mistake in 6 million deliveries, which is practically a Six Sigma level of performance.

Six Sigma Principles in Action

Customer-Centric Approach: The dabbawalas focus entirely on customer satisfaction. Timely delivery of home food is not just a service but a commitment. This reflects the Six Sigma principle of meeting customer requirements consistently.

Process Discipline and Standardization: Instead of using advanced technology, they rely on a color-coding and symbol system to identify each tiffin's origin, destination, and recipient. This low-cost yet effective system minimizes uncertainty and errors. Six Sigma emphasizes process control and error-proofing, which the dabbawalas achieve through this coding mechanism.

Continuous Improvement: Over decades, the dabbawalas have refined their routes, schedules, and coordination. Despite lacking formal education, their teamwork, peer learning, and Kaizen-like improvements mirror the Six Sigma philosophy of reducing variation and improving processes.

Team Culture and Accountability: The dabbawala system is based on a cooperative model where every member is both responsible and accountable. Each worker owns a share in the business, ensuring collective responsibility. Six Sigma also advocates for employee involvement and empowerment to maintain quality.

Error Management: Errors are rare but, when they occur, they are quickly corrected due to strong local networks. This feedback loop ensures that mistakes don't increase into larger failures, similar to Six Sigma's control phase in DMAIC (Define, Measure, Analyze, Improve, and Control).

The Mumbai dabbawalas have been studied by Harvard Business School, featured in the Forbes Global magazine, and even invited by Prince Charles and Richard Branson for interactions. Their recognition as a Six Sigma-level service provider is unique because it demonstrates how excellence is not necessarily a product of high technology but of discipline, teamwork, and process efficiency.

The dabbawala case shows that Six Sigma can be achieved with: Simple but standardized processes, Customer-first philosophy, Strong teamwork and accountability, Relentless focus on quality and timeliness

(a)	How do the Mumbai dabbawalas demonstrate Six Sigma principles in their daily operations despite minimal use of technology?	**07**
(b)	What role does teamwork and accountability play in maintaining near-perfect service delivery?	**07**

OR

(a)	Compare the dabbawala system with modern logistics companies like Swiggy or Zomato. What differentiates their operational excellence?	**07**
(b)	What lessons can global managers learn from the dabbawala system about achieving quality without more trust on technology?	**07**

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