GUJARAT TECHNOLOGICAL UNIVERSITY
MBA-SEMESTER-II-EXAMINATION-SUMMER-2025

Subject Code: 4529205   **Date: 10/06/2025**
Subject Name: Production & Operations Management
Time: 10:30 AM TO 01:30 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.

Q.1	Explain the following terms: (a) Production and Operation Management (b) Product Design (c) Layout (d) Project Management (e) Sequencing (f) Just in Time (g) MRP	**14**

Q.2 (a)	What do you mean by process design? Discuss following types of process design from the following:
	  i. Continuous process
	  ii. Batch process
	  iii. Job shop
		07

Q.2 (b)	Explain various steps in facility location planning.	**07**

<div align="center">OR</div>

Q.2 (b)	Oriflame cosmetics is offering price discounts to its customers if they purchase their 100- ml packs of shampoos in the following quantity ranges: Rs. 50 per unit for 10-19 units, Rs. 45 per unit for 20-29 units, and Rs. 40 per unit for 30 and more units. The CC of a pack of shampoo is estimated at 10% of the inventory value and the OC is Rs. 50. A customer has an annual demand of 100 packs of shampoo. Suggest the most economical order size for this customer.	**07**
Q.3 (a)	What is rough- cut capacity planning? Why is it required?	**07**
Q.3 (b)	Joe Palotty is scheduled to work seven days a week for the next two months due to the impending holiday season. Joe's workload for October comprises five assignments: A, B, C, D, and E. Job A is due on day 10, while job B is due on day 15. Job C is due on day 5, requires two days to process, and is due on day 12. Job D is due on day 12, and job E is due on day 8, and takes six days to process. The five tasks can be sequenced in 120 different ways. Sequence the jobs by (a) first-come, first-served (FCFS), (b) earliest due date (DDATE), and (c) shortest processing time (SPT). Determine the completion time and tardiness of each task in accordance with the specific sequencing rule. Joe's labour should be processed on a first-come, first-served basis. If not, which sequencing rule would you suggest to Joe?	**07**

Q.3 **(a)** What do you mean by line balancing? Discuss the objectives of line balancing? **07**
Describe several approaches to line balancing.

Q.3 **(b)** A tiny facility that sells school supplies and snacks is the auxiliary bookstore **07**
located in the student centre at Tech. The pay register is operated by a single
employee at the checkout counter. The server in this waiting line system is
represented by the cash register and operator, while the waiting line is formed by
the consumers who queue up at the counter to pay for their selections.

Customers arrive at a rate of 24 per hour according to a Poisson distribution
($\lambda=24$), and service times are exponentially distributed, with a mean rate of 30
customers per hour ($\mu=30$). The bookstore manager wants to determine the
operating characteristics for this waiting line system.

Find out the following:

    i. Probability of no customers in the system

    ii. Customers on the average in the queuing system

    iii. Customers on the average in the waiting line

    iv. Average time in the system per customer

    v. Average time in the waiting line per customer

Q.4 **(a)** The Japanese are generally credited with starting the global quality revolution that **07**
in the 1970s became an integral part of corporate culture, and eventually led to the
development of quality improvement programs systems like TQM and Six Sigma.
Research and write a report about what Japan did to initiate the quality movement
and why it differed from what was being done in the United States.

Q.4 **(b)** You are given the following project activities with their corresponding durations **07**
(in days) and dependencies:

Activity	Predecessor(s)	Duration (Days)
A	-	3
B	A	2
C	A	1
D	B, C	3
E	C	1
F	E	1
G	D, F	1

Draw the Network Diagram and find out Critical Path. Determine Early Start (ES)
and Early Finish (EF), Late Start (LS) and Late Finish (LF), Calculate Total Float.

OR

Q.4 **(a)** Describe the general steps a company must go through to obtain ISO 9001:2008 **07**
certification.

Q.4 **(b)** Twenty samples of n = 200 were taken by an operator at a workstation in a production process. The number of defective items in each sample were recorded as follows.   **07**

Sample	No. of Defectives	p	Sample	No. of Defectives	p
1	12	0.060	11	16	0.080
2	18	0.090	12	14	0.070
3	10	0.050	13	12	0.060
4	14	0.070	14	16	0.080
5	16	0.080	15	18	0.090
6	19	0.095	16	20	0.100
7	17	0.085	17	18	0.090
8	12	0.060	18	20	0.100
9	11	0.055	19	21	0.105
10	14	0.070	20	22	0.110

Management wants to develop a p-chart using 3-sigma limits. Determine UCL and LCL. Set up the p-chart and plot the observations to determine if the process was out of control at any point.

Q.5 **Case Study: Industrial Safety in a Chemical Manufacturing Plant**

ABC Chemicals Ltd., a large chemical manufacturing company, has a history of strong safety practices and compliance with industrial safety standards. However, the company recently faced a significant safety incident at one of its production units.

In early March 2024, a leak occurred in one of the storage tanks containing risky chemicals. This led to a small blast, followed by a fire. Fortunately, no loss of life occurred, but five employees suffered severe injuries due to burns and breathe of toxic gases. The fire was controlled after several hours of firefighting efforts, and the affected area was isolated.

Initial investigations indicated that the leak was caused by a stained valve, which had not been replaced despite being flagged for maintenance. The plant's safety inspection records showed that routine maintenance checks were missed due to staffing shortages. Although there were alarms and early warning systems in place, the employees on duty did not respond promptly due to a lack of adequate safety training for handling such emergencies. Personal protective equipment (PPE) was available, but the injured employees were not wearing it at the time of the incident.

ABC Chemicals Ltd. temporarily stopped operations at the plant to conduct a thorough safety audit. The company mandated safety training for all employees, emphasizing emergency response protocols and the importance of wearing PPE. A complete renovation of the maintenance schedule was initiated, ensuring that all safety-critical equipment receives priority attention. The company also installed advanced sensors to detect early signs of reaction and leakage.

The incident led to significant financial losses due to stoppage and repairs. Moreover, the company faced reputational damage and had to deal with legal consequences. The injured employees were compensated, and some are undergoing long-term medical treatment.

(a) What were the key factors that contributed to the safety incident at ABC Chemicals Ltd.? **07**

(b) Discuss the role of safety training in preventing accidents like the one described in the case study. How could the employees have responded better? **07**

OR

(a) Evaluate the post-incident actions taken by ABC Chemicals Ltd. Were they adequate? What additional measures could be implemented to improve industrial safety at the plant? **07**

(b) What lessons can other chemical manufacturing companies learn from this incident to enhance their own safety protocols? **07**

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