



VIT

Vellore Institute of Technology
(Approved to be University under Section 3 of UGC Act, 1956)

SLOT: B2+TB2

REG.NO.: 22BMM0008

SCHOOL OF MECHANICAL ENGINEERING
CONTINUOUS ASSESSMENT TEST (CAT) -I
WINTER SEMESTER 2024-2025

Programme Name & Branch	: B.Tech & Mechanical Engineering	
Course Code	: BMEE212L	
Course Name	: Quality Control and Improvement	
Class Number(s)	: VL2024250503794	
Faculty Members	: Dr.T.Sampath Kumar	
Date of the Examination	: 28.01.25	Slot: B2+TB2
Duration	: 90 minutes	Max. Marks : 50

General Instruction(s): Graph sheet should be provided

- Answer all Questions
- M - Max mark; CO - Course Outcome; BL - Blooms Taxonomy Level (1 - Remember, 2 - Understand, 3 - Apply, 4 - Analyse, 5 - Evaluate, 6 - Create)
- Course Outcomes Statements:
CO1. Evaluate the basic statistical concepts and quality tools an industrial case.
CO2. Demonstrate the ability to design, use, and interpret control charts for variables and attributes

Q. No	Question	M	CO	BL																														
1.	Customer tolerances for the height of a screw adjustment mechanism are 2.5 ± 0.030 m. For a product that just exceeds these limits, the cost to the customer for getting it fixed is Rs.50. Ten products are randomly selected and yield the following heights (in meters): 2.53, 2.48, 2.50, 2.49, 2.48, 2.52, 2.54, 2.47, 2.51, and 2.55. Find the average loss per product item.	10	01	BL3																														
2.	Suppose you had the opportunity to improve quality in an automotive organisation. Identify the areas of the automotive sector you would look to as opportunities for quality improvement and explain the same.	10	01	BL3																														
3.	With respect to control chart, explain the different types of natural and unnatural patterns of variation and their causes.	10	02	BL2																														
4.	A pharamedical company uses automatic machines to fill 500 ml chemical drug packets. A quality control inspector inspected four packets for each sample at given time intervals and measured the weight of each filled packet. The data for 20 samples are shown in the following table: <table border="1"> <thead> <tr> <th>Sample Number</th><th colspan="4">Weight of Filled Chemical Drug Packet (in ml)</th></tr> </thead> <tbody> <tr> <td>1</td><td>500</td><td>520</td><td>500</td><td>500</td></tr> <tr> <td>2</td><td>500</td><td>490</td><td>520</td><td>530</td></tr> <tr> <td>3</td><td>490</td><td>550</td><td>570</td><td>540</td></tr> <tr> <td>4</td><td>510</td><td>520</td><td>500</td><td>520</td></tr> <tr> <td>5</td><td>510</td><td>480</td><td>490</td><td>490</td></tr> </tbody> </table>	Sample Number	Weight of Filled Chemical Drug Packet (in ml)				1	500	520	500	500	2	500	490	520	530	3	490	550	570	540	4	510	520	500	520	5	510	480	490	490	10	02	BL3
Sample Number	Weight of Filled Chemical Drug Packet (in ml)																																	
1	500	520	500	500																														
2	500	490	520	530																														
3	490	550	570	540																														
4	510	520	500	520																														
5	510	480	490	490																														



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	6	520	500	520	500			
	7	520	510	530	510			
	8	530	490	520	500			
	9	510	490	500	510			
	10	520	520	490	520			
	11	520	500	510	500			
	12	480	500	520	510			
	13	530	510	520	510			
	14	500	510	510	500			
	15	490	520	500	510			
	16	520	500	530	500			
	17	520	560	490	510			
	18	500	490	500	510			
	19	520	500	530	500			
	20	500	490	500	490			
	Using the X and R-charts together, draw the conclusion about the process by assuming assignable causes for any out-of-control points. If the process is out-of-control, calculate the revised centre line and control limits to bring the process under statistical control. Use the quality control factors $A_2 = 0.729$, $D_3 = 0$ and $D_4 = 2.282$ for $n = 4$							
5.	The mean and standard deviation of 15 samples of size 12 for a production process are given in the following table:							
	Sample No	Mean	Standard Deviation	Sample No	Mean	Standard Deviation		
	1	9.5	1.2	9	8.75	2.1		
	2	7.5	1.5	10	9.75	3.5		
	3	10	2.6	11	7.25	2.6		
	4	8.25	3.2	12	10.25	1.1		
	5	7.25	1.9	13	9.25	2.2		
	6	9	2.6	14	10	1.6		
	7	10.5	5.4	15	10.5	3.2		
	8	9.25	2.4					
	Determine the control limits for the X and s-charts. Comment on whether the process variability and process mean are under statistical control or not. Use the quality control factors $A_3 = 0.886$, $B_3 = 0.354$, $B_4 = 1.646$ for $n = 12$.							

Verified
Q. Lin