

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination, November-December 2017

B. Tech. Mechanical Engineering, Semester: VII

Roll No.....

ME704 : Total Quality Management

Time: 3 hours

Max. Marks: 100

Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Assume suitable data wherever required and mention it clearly.
3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.
4. Statistical Tables are Permitted

Q.1A Objective type questions (10 questions @ 1 mark)

10

- i. Total Quality Management (TQM) focuses on
(A) Employee (B) Customer (C) Both A and B (D) None of the above
- ii. A product performance in comparison to its features and design is classified as
(A) learning quality (B) design quality
(C) conformance quality (D) business process quality
- iii. The objective of ISO-9000 family of Quality management is
(A) Customer satisfaction (B) Employee satisfaction
(C) Skill enhancement (D) Environmental issues
- iv. In hypothesis testing, type II error is represented by β and the power of the test is $1-\beta$ then
(A) The probability of rejecting H_0 when H_1 is true
(B) The probability of failing to reject H_0 when H_1 is true
(C) The probability of failing to reject H_0 when H_0 is true
(D) The probability of rejecting H_0 when H_0 is true
- v. Cause & Effect diagram used to
1. Identify & organize possible causes of problem
2. Identify possible causes of solution
3. Identify possible causes of problem & determining its relation
The correct answer is:
(A) only 1 (B) 1 & 3 (C) 2 & 3 (D) 1, 2 & 3
- vi. The causes of variation in statistical process control are
(A) Type I and Type II
(B) mean and range
(C) cycles, trends, seasonality, and random variations
(D) natural causes and assignable causes
- vii. The process capability is calculated as
(A) $(USL-LSL)/3\sigma$ (B) $(USL+LSL)/3\sigma$ (C) $(USL-LSL)/6\sigma$ (D) $(USL+LSL)/6\sigma$

Where USL =Upper specification limit, LSL =Lower specification limit

- viii. Which sampling method is used when simple random sampling method becomes inconvenient to use in large lots?
(A) systematic sampling (B) stratified sampling
(C) cluster sampling (D) sampling in stages

- ix. Match the following group 1 (charts) with group 2 (use) and select the correct option
- | Group 1 (charts) | Group 2 (use) |
|------------------|--|
| 1. R chart | A. study the number of defects per unit |
| 2. C chart | B. size of variable is studied |
| 3. P chart | C. dispersion of measured data |
| 4. X chart | D. defective units produced per subgroup |
- (A) 1 - A, 2 - B, 3 - D, 4 - C (B) 1 - C, 2 - D, 3 - B, 4 - A
 (C) 1 - A, 2 - D, 3 - B, 4 - C (D) 1 - C, 2 - A, 3 - D, 4 - B
- x. In factorial designs, the response produced when the treatments of one factor interact with the treatments of another in influencing the response variable is known as
 (A) the main effect (B) interaction (C) replication (D) none of the above

- Q.2 Short answer type questions (4 questions @ 2.5 marks) 10
- a The data in table 1 are diameters (in mm) of holes in a group of 12 wing leading edge ribs for a commercial transport airplane. Construct and interpret a box plot of those data

Table 1: Hole diameters (in mm) in wing leading edge ribs
120.5, 120.9, 120.3, 121.3, 120.4, 120.1, 120.5, 120.7, 121.1, 120.9, 120.8, 120.2

- b Show the relationship between a population and a sample with suitable diagrams.
 c Discuss Taguchi's Loss Function concept
 d Give the reasons why the cost of quality should be explicitly considered in an organization.

- Q.3A Discuss the Deming's philosophy for TQM. 05
 Q.3B Discuss the implementation of ISO-9000:2000 quality systems. 05
 Q.4A Explain QFD with a suitable example. 05
 Q.4B Explain sensitizing rules for Shewhart control charts 05
 Q.5A Name seven quality tools. Explain cause and effect (fishbone) diagram with suitable example. 05
 Q.5B Discuss, Are internal failure costs more or less important than external failure costs? 05
 Q.6A The Noise King Muffler Shop, a high-volume installer of replacement exhaust muffler systems, just received a shipment of 1,000 mufflers. The sampling plan for inspecting these mufflers calls for a sample size $n = 60$ and an acceptance number $c = 1$. The contract with the muffler manufacturer calls for an AQL of 1 defective muffler per 100 and an LTPD of 6 defective mufflers per 100. Calculate the OC curve for this plan, and determine the producer's risk and the consumer's risk for the plan 05
 Q.6B Distinguish between single-sampling and double-sampling plans and describe the unique characteristics of each. 05

OR

- Q.6B Describe: variation, continuous & discrete data, Frequency distribution 05
 Q.7 Write short notes on :- 10
 a. Kaizen
 b. six sigma
 c. Taguchi's Quality Loss Function
 Q.8A Discuss the need, construction and applications of control charts for variables. 10

OR

- Q.8 Frozen orange juice concentrate is packed in 6-oz cardboard cans. These cans are formed on a machine by spinning them from card board stock and attaching a metal bottom panel. By inspection of a can, we may determine whether, when filled, it could possibly leak either on the side scam or around the bottom joint. Such a nonconforming can has an improper seal on either the side scam or the bottom panel. Sample size (n) = 50 10

Table 2:

Sample No.	1	2	3	4	5	6	7	8	9	10
No of nonconforming cans.	12	15	8	10	4	7	16	9	14	10
Sample No.	11	12	13	14	15	16	17	18	19	20
No of nonconforming cans.	5	6	17	12	22	8	10	5	13	11
Sample No.	21	22	23	24	25	26	27	28	29	30
No of nonconforming cans.	20	18	24	15	9	12	7	13	9	6

- a) Set up a control chart to improve the fraction of nonconforming cans produced by this machine.
b) Is the process is in control? If not calculate the new control limits

- Q.9 In a medical school a new method of teaching in which professional actors played the roles of patients was introduced. The test scores of male and female students who were taught by either the conventional method or by a new form of training using role-play are shown in the table 3. Find FA, FB. Is there any difference in the mean test score under (i) Gender (ii) Teaching Method, using a two-way ANOVA at $\alpha = 0.05$. [A : Gender and B : Teaching Method] 10

Table 3: test scores of male and female students

Gender	Teaching Method	
	Conventional	Role Play
Male	64, 75, 60, 69, 42	38, 53, 33, 46, 38
Female	42, 55, 50, 56, 51	25, 23, 32, 28, 43

- Q.10 a) What are the ten conditions for the selection and evaluation of suppliers?
A b) When do you choose the attributes charts (P charts, c charts and u charts)? explain 5 + 5

OR

- Q.10 Consider a process by which coils are manufactured. Samples of size 5 are randomly selected from the process, and the resistance values (in ohms) of the coils are measured. The data values are given in Table 4. 10
B
- a) Find sample mean's and range for respective sample sizes
b) Calculate the trial control limits and construct trial X-bar & R-charts from the data given in Table 8.
c) Is the process is in control? If not calculate the new control limits for X-bar & R-charts

Table 4: Coil Resistance data					
Sample	Observations	comments	Sample	Observations	comments
1	20, 22, 21, 23, 22		14	20, 21, 22, 21, 22	
2	19, 18, 22, 20, 20		15	20, 24, 24, 23, 23	
3	25, 18, 20, 17, 22	New vendor	16	21, 20, 24, 20, 21	
4	20, 21, 22, 21, 21		17	20, 18, 18, 20, 20	
5	19, 24, 23, 22, 20		18	20, 24, 22, 23, 23	
6	22, 20, 18, 18, 19		19	20, 19, 23, 20, 19	
7	18, 20, 19, 18, 20		20	22, 21, 21, 24, 22	
8	20, 18, 23, 20, 21		21	23, 22, 22, 20, 22	
9	21, 20, 24, 23, 22		22	21, 18, 18, 17, 19	High Temperature
10	21, 19, 20, 20, 20		23	21, 24, 24, 23, 23	Wrong die
11	20, 20, 23, 22, 20		24	20, 22, 21, 21, 20	
12	22, 21, 20, 22, 23		25	19, 20, 21, 21, 22	
13	19, 22, 19, 18, 19				