

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination, November- 2016

B. Tech. In Mechanical Engineering, Semester: VII

Roll No.....

ME704 : Total Quality Management

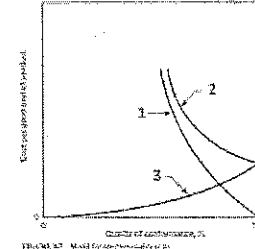
Time: 3 hours

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.	Match List-I (Scientist) with List-II (research work) and select answer using the codes given below the lists: <table><tr><th>List-I</th><th>List-II</th><th></th></tr><tr><td>A. Scewhart</td><td>1. Less function in quality</td><td>a) A-3, B-1, C-2 b) A-4, B-3, C-1</td></tr><tr><td>B. Taguchi</td><td>2. Queuing Model</td><td>c) A-4, B-1, C-2 d) A-3, B-4, C-1</td></tr><tr><td>C. Erland</td><td>3. Zero defect</td><td></td></tr><tr><td></td><td>4. Control charts</td><td></td></tr></table>	List-I	List-II		A. Scewhart	1. Less function in quality	a) A-3, B-1, C-2 b) A-4, B-3, C-1	B. Taguchi	2. Queuing Model	c) A-4, B-1, C-2 d) A-3, B-4, C-1	C. Erland	3. Zero defect			4. Control charts					
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	4. Control charts																			
ii.	Match List-I (trend/Defect) with List-II (chart) and select the correct answer using the codes given below the lists: <table><tr><th>List-I</th><th>List-II</th><th></th></tr><tr><td>A. Trend</td><td>1. R-Chart</td><td>a) A-5, B-3, C-2, D-4 b) A-3, B-1, C-4, D-2</td></tr><tr><td>B. Dispersion</td><td>2. C-Chart</td><td>c) A-3, B-1, C-2, D-4 d) A-3, B-4, C-5, D-2</td></tr><tr><td>C. Number of defects</td><td>3. X-Chart</td><td></td></tr><tr><td>D. Number of defectives</td><td>4. Np-Chart</td><td></td></tr><tr><td></td><td>5. U-Chart</td><td></td></tr></table>	List-I	List-II		A. Trend	1. R-Chart	a) A-5, B-3, C-2, D-4 b) A-3, B-1, C-4, D-2	B. Dispersion	2. C-Chart	c) A-3, B-1, C-2, D-4 d) A-3, B-4, C-5, D-2	C. Number of defects	3. X-Chart		D. Number of defectives	4. Np-Chart			5. U-Chart		
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iii.	A control chart is established with limits of ± 2 standard errors for use in monitoring samples of size $n=20$. Assume the process to be in control. What is the likelihood of a sample mean falling outside the control limits a) 97.7% b) 4.5 % c) 95.5% d) 2.3%																			
iv.	Consider a count variable X following a Poisson's distribution such that the zero count (that is $X=0$) is not observable. Based on n observations $x_1, \dots, x_n$ from this distribution the quantity for which $\bar{x}$ is an unbiased estimator is a) λ b) $1/(1-e^{-\lambda})$ c) $\lambda / (1-e^{-\lambda})$ d) $\lambda e^{-\lambda} / (1-e^{-\lambda})$																			
v.	In the probability of an acceptance of a 1% defective lot is 0.95. then AOQ is a) 0.01 b) 0.10 c) 0.095 d) 0.0095																			
vi.	Consider the following statements in respect of double sampling plan: 1. Average number of pieces inspected is double that of single sampling 2. Average number of pieces inspected is less than that for single sampling 3. Decision to accept or reject the lot is taken only after the inspection of both samples 4. Decision to accept or reject the lot is reached sometimes after one sample and sometimes after two samples a) 1, 2 and 3 b) 2, and 4 c) 1 and 4 d) 2 and 3																			

vii.	Consider the following statements with respect to control charts for attributes: 1. the lower control limit is non-negative 2. Normal distribution is the order for this data 3. The lower control limit is not significant 4. These charts give the average quality characteristics Which of these statements are correct? a) 1,3 and 4 b) 2, 3 and 4 c) 1, 2 and 3 d) 1, 2 and 4	
viii.	The main purpose of the Taguchi methods is to: a) reduce costs and prevent any unnecessary costs before producing the product or service b) articulate the 'voice of the customer's c) Test the robustness of a design. d) Create a 'house of quality'	
ix.	From the fig. 1. displayed below, identify the curves: a) 1-cost of prevention, 2-total quality cost 3-failure cost b) 1-failure cost 2-total quality cost, 3-cost of appraisal+prevention c) 1-Total quality cost, 2-failure cost, 3-cost of appraisal+prevention d) 1-Total Cost, 2-Cost of Appraisal, 3-Failure Cost	 Fig. 1
x.	A histogram ordered by frequency of occurrence that shows how many results were generated by each identified cause is: a) Statistical Histogram b) Juran Histogram c) Fishbone Diagram d) Pareto Diagram.	
Q.1B	Short answer type questions (4 questions @ 2.5 marks)	10
a	Define quality cost and give the primary categories of quality cost.	
b	What is a QFD? What are the benefits of QFD?	
c	Describe in short vendor quality rating (VQR)	
d	Differentiate between single sampling plan and double sampling plan	
Q.2A	Define and give the mathematical relations of the following:	06
	1. Normal Distribution 2. Lognormal Distribution	
	3. Exponential Distribution 4. Gamma Distribution and	
	5. Weibull Distribution	
Q.2B	Explain sensitizing rules for Shewhart control charts	04
Q.3A	Explain following with suitable figures/charts:	06
	1. histogram, 2. Checksheet and 3. Pareto chart.	
Q.3B	Name and describe the various steps in application of 6 σ .	04
Q.4A	Advantages and dis-advantages of acceptance sampling	05
Q.4B	What is 'Quality Audit'? Name and describe the various types of quality audits.	05
Q.5A	Explain the operating characteristics curve with respect to sampling, inspection and the meaning of the term: 1) AQL 2) LTPD 3) Producer's Risk	06
Q.5B	Construct OC curve for the sampling plan N=2000, n=50, c=2	04
Q.6A	Discuss the signal-to-noise ratio. How is it used in the Taguchi method?	05

- 6B Control Charts for $\bar{X}$ and R are maintained on certain dimensions of a manufactured part, measured in mm. The subgroup size is 4. The values of $\bar{X}$ and R are computed for each subgroup. After 20 subgroups $\sum \bar{X} = 412.83$ and $\sum R = 3.39$. Compute the values of 3 sigma limits for the $\bar{X}$ and R charts and estimate the values of σ' on the assumption that the process is in statistical control.

05

Q.7A When do you choose the attributes charts (P charts, c charts and u charts)? explain

5

Q.7B The Data given in the following table presents the number of nonconformities observed in 26 successive samples of 100 printed circuit boards. Note that, for the reason of convince, the inspection unit is defined as 100 boards. Setup a c chart for these data.

5

Sample Number	1	2	3	4	5	6	7	8	9	10	11	12	13
No. of Nonconformities	21	24	16	12	15	5	28	20	31	25	20	24	16
Sample Number	14	15	16	17	18	19	20	21	22	23	24	25	26
No. of Nonconformities	19	10	17	13	22	18	39	30	24	16	19	17	15

Q.8 a) Write the fourteen steps of Deming's philosophy for improving quality, productivity and competitiveness.

7

b) The data in Table 2, 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.

3

Table 2: Hole diameters (in mm) in wing leading edge ribs

120.5, 120.4, 120.7, 120.9, 120.2, 121.1, 120.3, 120.1, 120.9, 121.3, 120.5, 120.8

Q.9A The following data were obtained over a 10 days period to initiate X-bar and R control chart for a quality characteristic of a certain manufactured product that had required a substantial amount of rework. All the figures apply to product made on a single machine

Sample No.	1	2	3	4	5	6	7	8	9	10
X-bar	177.6	176.6	178.4	176.6	177.0	179.4	178.6	179.6	178.8	178.2
R	23	8	22	12	7	8	15	6	7	12
Sample No.	11	12	13	14	15	16	17	18	19	20
X-bar	179.8	176.4	178.4	178.2	180.6	179.6	177.8	178.4	181.6	177.6
R	9	8	7	4	6	6	10	9	7	10

by a single operator. The subgroup size was 5. Two subgroups were taken per day.

(a) Determine trial control limits for X-bar and R charts

(b) What preliminary conclusions can you draw about the statistical control from your observations and analysis of the data and of the control charts?

If process is found out of control then find the revised control limits by removing the points which are falling outside the control limits.

OR

Q.9B Suppose that a random sample of $n = 5$ was selected from the vineyard properties for sale in Bangalore, India, in each of three years. The following data (Table 4) are consistent with summary information on price per acre for disease-resistant grape vineyards in Bangalore. Carry out an ANOVA to determine whether there is evidence to support the claim that the mean price per acre for vineyard land in Bangalore was not the same for each of the three years considered. Test at the 0.05 level and at the 0.01 level.

10

Table 4: price per acre for disease-resistant grape vineyards Summery

Year of Sampling	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
2013	30000	34000	36000	38000	40000
2014	30000	35000	37000	38000	40000
2015	40000	41000	43000	44000	50000