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Total No. of Questions : 16

Total No. of Pages : 03

B.Tech. (Ind. Engg. & Mgt.) (TQM) (Sem.-4) STATISTICAL QUALITY CONTROL Subject Code : IEM-403 M.Code : 61018

Time: 3 Hrs.

Max. Marks: 40

INSTRUCTIONS TO CANDIDATES :

- 1. Attempt EIGHT out of TEN questions from SECTION-A carrying TWO marks each.
- 2. Attempt any FOUR out of SIX questions from SECTION-B carrying SIX marks each.

SECTION-A

Answer briefly :

- It has been argued that the definition of product quality as 'fitness for intended purpose' is more likely to lead to commercial success than is a definition such as 'conformance to specification'. Discuss the implications of these alternative definitions for the Quality Control function within a manufacturing enterprise.
- 2) Explain the classification of defects on basis of seriousness.
- 3) Distinguish between the use of the mean, median, and mode in quality control applications.
- 4) What are the advantages and disadvantages of using variables rather than attributes in control charts?
- 5) Describe the use of the Pareto concept in the selection of characteristics for control charts.
- 6) Discuss Taguchi quadratic loss function.
- 7) Explain the concept of process capability and when it should be estimated. What is its impact on nonconformance?
- 8) What condition must exist prior to calculating the process capability?
- 9) Explain the difference between average sample number and average total inspection. State any assumptions made.
- 10) Distinguish between producer's risk and consumer's risk.

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SECTION-B

- 11) Explain the objectives of inspection in the manufacturing organizations. Discuss the need for inspection and testing. Also, explain various types of inspection procedures adopted in manufacturing organizations.
- 12) Explain the difference between natural tolerance limits and specification limits. How does a process capability index incorporate both of them? What assumptions are made in constructing the natural tolerance limits?
- 13) Consider a single sampling plan with a lot size of 1500, sample size of 150, and acceptance number of 3. Construct the OC curve. If the acceptable quality level is 0.05% nonconforming and the limiting quality level is 6% nonconforming, describe the protection offered by the plan at these quality levels.
- 14) The roughness of the ground surface of a component cannot exceed 0.02 units. A random sample of components ground by a surface-grinding machine yielded the following estimates : Mean roughness = 0.01. Standard deviation = 0.003. Computer the C_p index of this process and estimate the proportion of defectives expected to be generated by the process, assuming that the surface roughness measurements follow normal distribution.
- 15) The thickness of a printed circuit board is an important quality parameter. Data on board thickness (in inches) are given in Table below for 25 samples of three boards each.
 - a) Set up \overline{x} and R control charts. Is the process in statistical control?
 - b) Estimate the process standard deviation.
 - c) What are the limits that you would expect to contain nearly all the process measurements?

Printed Circuit Board Thickness								
Sample Number	x_1	x_2	<i>x</i> ₃	Sample Number	x_1	x_2	x_3	
$ \begin{array}{c} 1\\ 2\\ 3\\ 4\\ 5\\ 6\\ 7\\ 8\\ 9\\ 10\\ 11\\ 12\\ 13\\ \end{array} $	$\begin{array}{c} 0.0629\\ 0.0630\\ 0.0628\\ 0.0634\\ 0.0619\\ 0.0613\\ 0.0630\\ 0.0628\\ 0.0623\\ 0.0631\\ 0.0635\\ 0.0623\\ 0.0635\\ \end{array}$	$\begin{array}{c} 0.0636\\ 0.0631\\ 0.0631\\ 0.0630\\ 0.0628\\ 0.0629\\ 0.0629\\ 0.0627\\ 0.0626\\ 0.0631\\ 0.0630\\ 0.0630\\ 0.0631\\ \end{array}$	$\begin{array}{c} 0.0640\\ 0.0622\\ 0.0633\\ 0.0631\\ 0.0630\\ 0.0634\\ 0.0625\\ 0.0622\\ 0.0633\\ 0.0633\\ 0.0638\\ 0.0630\\ 0.0630\end{array}$	14 15 16 17 18 19 20 21 22 23 24 25	$\begin{array}{c} 0.0645\\ 0.0619\\ 0.0631\\ 0.0616\\ 0.0630\\ 0.0636\\ 0.0640\\ 0.0628\\ 0.0615\\ 0.0630\\ 0.0635\\ 0.0623\\ \end{array}$	$\begin{array}{c} 0.0640\\ 0.0644\\ 0.0627\\ 0.0623\\ 0.0630\\ 0.0631\\ 0.0635\\ 0.0625\\ 0.0625\\ 0.0625\\ 0.0622\\ 0.0629\\ 0.0629\\ 0.0629\end{array}$	$\begin{array}{c} 0.0631\\ 0.0632\\ 0.0630\\ 0.0631\\ 0.0626\\ 0.0629\\ 0.0629\\ 0.0616\\ 0.0619\\ 0.0630\\ 0.0635\\ 0.0630\\ \end{array}$	

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16. The number of customers who are not satisfied with the service provided in a retail store is found for 20 samples of size 100 and shown in Table. Construct a control chart for the proportion of dissatisfied customers. Revise the control limits, assuming special causes for points outside the control limits.

Sample	Number of Dissatisfied Customers	Sample	Number of Dissatisfied Customers				
1	2	11	5				
2	5	12	4				
3	4	13	2				
4	3	14	5				
5	4	15	3				
6	2	16	12				
7	3	17	3				
8	2	18	2				
9	4	19	5				
10	11	20	2				
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TABLE

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.

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