

## INDUSTRIAL ENGINEERING

FIFTH SEMESTER- (REGULATION-2012)

IE8503 QUALITY CONTROL AND ASSURANCE

(Statistical Tables are permitted)

Time: 3 hr

Max. Mark: 100

Answer ALL Questions

Part-A (10 X 2 = 20 Mark)

1. Define Quality System
2. Indicate the major difference between Quality Assurance and Control
3. When do we expect Type I error?
4. Define ARL and Warning Limits
5. What are Linear Trend Chart?
6. Define Gauge Repeatability and Reproducibility
7. Write down the formulae of U chart?
8. What type of distribution does C control chart use and why?
9. What are the applications of Sequential Sampling Plan?
10. What are Multiple sampling plan?



Part-B (5 X 16 = 80 Marks)

11 (a) Discuss the Taguchi's QLF with the three cases? (16)

12 (a) Explain the Steps in the computation of X-bar, R and S chart in detail? (16)

OR

12 (b) The average time that a customer has to wait (in minutes) for the arrival of a cab after calling the company has been observed for random sample of size 4. The data for 20 such samples are shown in the table. Previous analysis shows that the upper and lower control limits for an X bar chart, when the process was in control as 10.5 and 7.7 min, respectively. What is your estimate of the standard deviation of the waiting time for a customer? Construct a moving average control chart using a span of 3. What conclusion can you draw from the chart? (16)

Sample	1	2	3	4	5	6	7	8	9	10
Average waiting time, X	8.4	6.5	10.8	9.7	9.0	9.4	10.2	8.1	7.4	9.6
Sample	11	12	13	14	15	16	17	18	19	20
Average waiting time, X	8.8	10.0	9.5	9.6	8.3	9.9	10.2	8.3	8.6	9.9

13 (a) Estimate the standard deviation of measurement error and gage repeatability and reproducibility? (16)

OR

13 (b) Explain the steps followed in the computation of Center Line for Linear trend chart? (16)

14 (a) The number of scratch mark for a particular piece of furniture is recorded for samples of size 10. The results are shown in the table 1.2 for 25 samples. Construct a chart for the number of scratch marks revise the control limits, assuming special causes for the out of control points. Suppose that the management sets a goal of four scratch mark on average for 10 pieces. Set up an appropriate control chart, and discuss whether the process is capable of meeting the standard. (16)

Table 1.2 Data on scratch marks on furniture pieces

Sample	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Scratch Marks	6	3	12	8	9	7	17	5	6	4	8	7	18	9	11

Sample	16	17	18	19	20	21	22	23	24	25
Scratch Mark	6	5	7	8	4	9	8	4	7	6

OR

14 (b) Non conformities in automobiles fall into three categories – Serious, Major and Minor. 25 samples of five automobiles are chosen, and the total no of non-conformities in each category is reported. Table 1.3 Shows the results. Assuming a weighting system of 50,10 and 1 for serious, major and minor non conformities, respectively, Construct a demerits per unit control chart. Revise the control limits if necessary, assuming special causes for pints that are out of control. (16)

Table 1.3

Sample	1	2	3	4	5	6	7	8	9	10	11	12	13
Serious Defects	0	0	1	1	0	0	0	1	0	2	1	0	0
Major Defects	5	3	0	2	6	3	1	2	4	6	3	5	0
Minor Defects	8	2	6	1	8	3	10	5	9	6	2	8	9
Sample	14	15	16	17	18	19	20	21	22	23	24	25	
Serious Defects	0	0	0	1	0	0	0	1	0	0	0	0	
Major Defects	7	2	4	0	3	5	2	1	3	2	4	2	
Minor Defects	12	8	3	5	2	8	6	4	10	12	7	4	

15 (a) Design a single sampling plan from the following parameters:

$$P_1=0.02, P_2=0.08, \text{Producers Risk}=0.05 \text{ and Consumers Risk}=0.10$$

(16)

OR

15 (b) Describe the procedure followed in Sequential Sampling Plan and IS 2500

(16)

