Reg. No.										

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

VII SEMESTER B.TECH (AUTOMOBILE ENGINEERING)

END SEMESTER EXAMINATIONS, NOV/DEC 2015

SUBJECT: QUALITY CONTROL AND RELIABILITY ENGINEERING - PROGRAM ELECTIVE-IV [AAE-479]

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ANY FIVE FULL** the questions.
- Missing data may be suitable assumed.
- Use of statistical data is permitted

1A. The baking time of painted corrugated sheet metal is of interest. Too much time will cause the paint to flake, and too little time will result in an unacceptable finish. The specifications on baking time are 10 ± 0.2 minutes. Random samples of size 6 are selected and their baking times noted. The sample means and standard deviations are calculated for 20 samples, with the following results: **(07)**

$$\sum_{i=1}^{20} \bar{X}_i = 199.8 \qquad \sum_{i=1}^{20} s_i = 1.40$$

(a) Calculate the centerline and control limits for the *X- bar* and *s-charts*. (b) Estimate the process mean and standard deviation, assuming the process to be in control. (c) Is the process capable? What proportion of the output is nonconforming? (d) If the mean of the process can be shifted to 10 minutes, would you recommend such a change?

1B. Compute Average Sample Number for the following sampling plan: n1=60, n2=90, c1=2, r1=5, c2=5, and r2=6 Assume 2% non-confirming items. **(03)**

2A. Draw OC curve for the sampling plan, n=100, C=2 and N=1000 and determine AOQ for 2% non-confirming items **(07)**

2B. Given the linear failure rate function $\lambda(t)=5X10^{-6}\,t$ where t is operating hours. What is the design life if 0.98 reliability is desired? **(03)**

3A. Explain the difference in interpretation between an observation falling below the lower control limit on an X-chart and one falling below the lower control limit on at R-chart. **(03)**

3B. Consider double sampling plan given by the following parameters: N=2200, n1=60, c1=0, r1=5, n2=100, c2=6, r2=7. Find the probability of accepting the lots that are 3% non-confirming. What is the probability of accepting a lot on first sample? What is probability of making a decision on the first sample? **(05)**

3C. Describe the benefits of quality control in brief. **(02)**

4A 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 is shown in the table below. Construct a control chart for the proportion of dissatisfied customers. Revise the control limits assuming special causes for the points outside the control limits. **(05)**

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

4B. List three advantages and disadvantages each of the Control chart for variables and control chart for attributes. **(03)**

4C Define: (i) AOQL (ii) LTPD (iii) Produers Risk and (iv) Consumers Risk **(02)**

5A. Explain with neat diagram the Shewhart cycle for quality **(05)**

5B. Explain the techniques for evaluating service quality **(03)**

5C. Describe process capability in brief. **(02)**

6A. Explain any four reliability testing methods. **(04)**

6B. A computer system composed of 5 identical components in series. The reliability of the system desired is 0.999. Compute the individual component reliability, unreliability and their failure rate. **(03)**

6C. Explain how Deming's quality policy differs from that of Crosby **(03)**