2101296

BACHELOR OF VOCATION
Mechanical Manufacturing
Subject: Quality Control and Reliability Engineering
Subject Code: IMS-601
Semester: Third
January 2021
Theory (External): 70 Marks
Time: 03 Hours

Instructions to the Students

1. This Question paper consists of two Sections. All sections are compulsory.
2. Section A comprises 10 questions of objective type in nature. All questions are compulsory. Each question carries 2 marks.
3. Section B comprises 8 essay type questions out of which students need to do any 5. Each question carries 10 marks.
4. Read the questions carefully and write the answers in the answer sheets provided.
5. Do not write anything on the question paper.
6. Wherever necessary, the diagram drawn should be neat and properly labelled

Roll Number

SECTION –A (SHORT/OBJECTIVE TYPE QUESTIONS)
(10x2=20 Marks)

A. Distinguish between quality assurance and quality control.

B. Name any four quality tools used in statistical quality control.

C. Distinguish between chance and assignable causes.

D. What is process capability index? Explain its significance.

E. Define the terms AQL and LTPD.

F. What is the effect of sample size on the OC curve?

G. What is OPL listing?

H. Three lamps are connected in parallel to produce light in a hall. The reliabilities are 0.92, 0.95 and 0.96. Find the reliability of the total lamp system. If the systems are connected in series, determine the reliability of the system.

I. What is shape parameters? State its effect on the failure rate.

J. An electronic system has a MTBF of 1000 hours and a MTTR of 40 hours. Determine its availability.

SECTION – B (ESSAY TYPE QUESTIONS)
(5×10 = 50 Marks)

1. The percent of water absorption is an important characteristic of common building brick. A certain company occasionally measured this characteristic of its product but records were never kept. It was decided to analyze the process with control chart. Twenty-five samples of four bricks each yielded these results.

Sample No.	1	2	3	4	5	6	7	8	9	10	11	12	13
X	15.01	12.3	7.4	8.7	8.8	11.7	10.2	11.5	11.2	10.2	9.6	7.6	7.6
R	9.1	9.9	9.7	6.7	7.1	9.1	12.1	10.8	13.5	6.9	5.0	8.2	5.4

Sample No.	14	15	16	17	18	19	20	21	22	23	24	25
X	9.8	8.8	8.1	6.3	10.5	9.7	11.7	13.2	12.5	7.5	8.8	8.0
R	17.5	10.5	4.4	4.1	5.7	6.4	4.6	7.2	8.3	6.4	6.9	6.4

Estimate the control limits for X and R chart. If any point lies out of the control limits, estimate the revised control limits.

2. Construct the OC curve for the single sampling plan:
N = 830, n = 62, c = 1 and r = 2. Use at least seven points

3. Given $P_{0.10} = 0.053$ and $P_{0.95} = 0.014$, Determine the single sampling plan which exactly meets the consumer's stipulation and comes closer to the producer's stipulation.

4. Determine the acceptance equation for the following double sampling plan.
   $N = 60000$ $n_1 = 80$, $c_1 = 2$, $r_1 = 4$, $n_2 = 160$, $c_2 = 5$, $r_2 = 6$.
   Determine also the probability of acceptance for an incoming process quality of 2% (i.e. 100 p' = 2%)

5. a) Distinguish between a P chart and a C chart. Discuss the situations in which C chart is most appropriate to use.
   b) Write short notes on the following:
   1) Quality circle
   2) ISO 9000
   3) Kaizen

6. a) Determine the acceptance and rejection limits for a sequential life testing plan where the acceptable mean life (q_o) is 50,000 hours and the unacceptable mean life (q_1) is 2000 hours. The desired producer's and consumer's risks are 10%.
   b) Construct an OC curve for the sampling plan specified as n = 24, T = 149 and r = 8. Use at least seven points.

7. a) What is reliability? Explain in detail the different techniques employed in improving the reliability.
   b) Explain briefly the product life cycle

8. Determine the time terminated, with replacement mean life sampling plan where the producer's risk of rejecting lots with mean life of 800 hours is 0.05 and the consumer's risk of accepting lots with mean life of q_1 = 220 hours is 0.10. The sample size is 30.

*****END OF PAPER*****