

Roll No



**PRESIDENCY UNIVERSITY
BENGALURU**

SET A

**SCHOOL OF ENGINEERING
END TERM EXAMINATION – MAY / JUNE 2024**

Semester : Semester VIII - 2020
Course Code : MEC3016
Course Name : Statistics and Quality Control
Program : B.Tech.

Date : June 03, 2024
Time : 01.00pm - 04.00pm
Max Marks : 100
Weightage : 50%

Instructions:

- (i) Read all questions carefully and answer accordingly.
- (ii) Question paper consists of 3 parts.
- (iii) Scientific and non-programmable calculator are permitted.
- (iv) Do not write any information on the question paper other than Roll Number.

PART A

ANSWER ANY FIVE QUESTIONS

5QX2M=10M

1. Write any two objectives of quality control. (CO1) [Knowledge]
2. What are the two major components of cost of quality? (CO1) [Knowledge]
3. What is an attribute data? Give example. (CO2) [Knowledge]
4. Define Parts Per Million Defective (PPM). (CO2) [Knowledge]
5. What is the purpose of control Chart? (CO3) [Knowledge]
6. What is Defects per Unit (DPU)? (CO3) [Knowledge]
7. What is Six sigma quality? (CO4) [Knowledge]

PART B

ANSWER ANY FIVE QUESTIONS

5QX10M=50M

8. What is cost of quality? Explain poor quality in detail with examples. (CO1) [Comprehension]

9. Write in detail about the following quality control tools which are commonly used in various types of industries.

(CO1) [Comprehension]

10. Explain the following important terms in detail:

1. Defects Per Unit (DPU)
2. Defects Per Million Opportunities (DPMO)
3. Parts Per Million Defective (PPM)
4. Rolled Throughput Yield (RTY)

(CO2) [Comprehension]

11. Why sampling is used in quality control? ii) In a factory, there is a decision on number of samples to be used for estimating mean weight 400 products, assuming 99% of confidence level and acceptable error of 0.5 kg. Standard deviation of the population is 2.

Sometimes, gathering information on a complete population is too expensive, time-consuming.

Example: The process we are measuring would require destructive testing (taste tests, car crash tests, etc.).

(CO2) [Comprehension]

12. A factory manufacturing small bolts. To check the quality of the bolts, the manufacturer selected 20 samples of same size 100 from the manufacturing process time to time. He/she visually inspected each selected bolt for certain defects. After the inspection, he/she obtained the following data:

Sample No	1	2	3	4	5	6	7	8	9	10
Proportion Defective	0.1	0.04	0.08	0.15	0.08	0	0.01	0.05	0.05	0.08
Sample No	11	12	13	14	15	16	17	18	19	20
Proportion Defective	0.1	0	0.06	0.05	0.03	0.2	0.05	0.07	0.01	0.08

Estimate the proportion defective of the process. Does the process appear to be under control with respect to the proportion of defective bolts?

(CO3) [Comprehension]

13. Twenty-five samples of size 4 were taken from a production process. The sample means are listed in chronological order below. The mean of the sample means and the pooled standard deviation are $\bar{x} = 13.3$ and $S = 3.8$, respectively.

14.5	10.3	17.0	9.4	13.2
9.3	17.1	5.5	5.3	16.3
10.5	11.5	8.8	12.6	10.5
16.3	8.7	9.4	11.4	17.6
20.5	21.1	16.3	18.5	20.9

- a. Find the centerline and control limits for the \bar{x} chart.
- b. Plot the sample means on the \bar{x} chart.
- c. Is the process under control? Explain.

(CO3) [Comprehension]

14. Explain the five phases of DMAIC in detail with a suitable tools and techniques to be used in each phase.

(CO4) [Comprehension]

PART C

ANSWER ANY TWO QUESTIONS

2QX20M=40M

- 15.** A diet doctor claims that the average North American is more than 20 pounds overweight. To test his claim, a random sample of 20 North Americans was weighed, and the difference between their actual and ideal weights was calculated. The data are listed here. Do these data allow us to infer at the 5% significance level that the doctor's claim is true?

16	23	18	41	22	18	23	19	22	15
18	35	16	15	17	19	23	15	16	26

(CO2) [Application]

- 16.** An engineer measured the Brinell hardness of 25 pieces of ductile iron that were annealed. The resulting data were:

170	167	174	179	179	187	179	183	179
156	163	156	187	156	167	156	174	170
183	179	174	179	170	159	187		

The engineer assumes that the mean Brinell hardness of all such ductile iron pieces is greater than 170. Using hypothesis testing, verify the assumption of the engineer is correct or not.

(CO2) [Application]

- 17.** A cable insulation manufacturing company wants to monitor the diameter of cable insulators. During the base period 10 samples are observed; the sample size is 4. The measurements of individual diameters are as follows:

Sample No.	1	2	3	4	5	6	7	8	9	10
Observations	4.4	5.2	5.0	4.6	5.3	4.9	5.2	5.3	5.2	5.1
	4.7	5.3	5.9	4.6	5.8	5.3	5.4	5.5	5.2	5.4
	4.8	6.1	5.8	5.3	5.4	5.2	4.8	4.9	5.1	5.3
	4.6	5.2	4.8	5.0	5.1	5.7	5.1	4.8	4.9	5.4

Construct control charts for X-bar and R. Also check whether the process is statistically in control or not.

(CO3) [Application]