

27/12/2022

Reg. No.

Question Paper Code

11514

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV/DEC 2022

Seventh Semester

Mechanical Engineering

(Common to Production Engineering)

ME8098 - QUALITY CONTROL AND RELIABILITY ENGINEERING

(Regulations 2017)

(Use of approved Statistical Table is permitted)

Duration: 3 Hours

Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

Answer ALL Questions

- | | Marks,
K-Level, CO |
|---|-----------------------|
| 1. Define the term Quality. | 2,K1,CO1 |
| 2. State the use of X-Chart. | 2,K1,CO1 |
| 3. What is meant by control limits in a control chart? Write down the formulae for finding the various control limits used in various control charts. | 2,K2,CO2 |
| 4. If for a process, 18 out of 20 points are plotted above the CL but below the upper control limit, and only 2 of 20 are plotted between the centre line and the lower control limit, what can we say about the process state? | 2,K2,CO2 |
| 5. Define the following terms with regard to quality: (a) AQL (b) RQL. | 2,K1,CO3 |
| 6. Distinguish between producer's Risk and consumer's Risk. | 2,K2,CO3 |
| 7. List the Objectives of Life Testing. | 2,K1,CO4 |
| 8. What is the main objective of failure data analysis? | 2,K1,CO4 |
| 9. Differentiate between SQC and SPC. | 2,K2,CO6 |
| 10. Differentiate between Reliability and Quality. | 2,K2,CO6 |

PART - B (5 × 13 = 65 Marks)

Answer ALL Questions

11. a) Construct an Average Control Chart and Range Control Chart for the data tabulated below. Also, give your interpretation for the same. 13,K2,CO1
Use the following statistical values for the construction of the abovementioned control chart: $A_2 = 0.58$, $D_3 = 0$, $D_4 = 2.11$

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create

11514

Sample No.	Measurements per sample				
	I	II	III	IV	V
1	0.488	0.482	0.551	0.475	0.499
2	0.385	0.377	0.421	0.477	0.395
3	0.285	0.233	0.299	0.225	0.301
4	0.325	0.385	0.331	0.299	0.315
5	0.399	0.422	0.415	0.395	0.385
6	0.485	0.558	0.551	0.658	0.595
7	0.541	0.533	0.557	0.551	0.549

OR

- b) Explain Six Sigma Concepts by citing examples.

13,K2,CO2

12. a) To monitor the manufacturing process of laptops, a quality control engineer randomly selects 50 laptops from the production line, each day over a period of 20 days. The laptops are inspected for certain defects and the number of defective laptops found each day is recorded in the following table. Construct an appropriate control chart and state whether the process is in control.

13,K2,CO2

Day	No. of Laptops Inspected	No. of Defective Laptops	Day	No. of Laptops Inspected	No. of Defective Laptops
1	50	4	11	50	6
2	50	8	12	50	1
3	50	6	13	50	5
4	50	10	14	50	3
5	50	4	15	50	2
6	50	3	16	50	3
7	50	4	17	50	7
8	50	7	18	50	9
9	50	8	19	50	2
10	50	4	20	50	4

OR

- b) What is meant by process variability? Explain the same in detail.

13,K2,CO2

13. a) Construct an OC curve for a single sampling plan where the lot size is 2000, the sample size is 50, and the acceptance number is 2.

13,K2,CO3

OR

- b) In detail, explain the ABC Standard with reference to OC Curve.

13,K2,CO3

14. a) In detail, explain the Bath Tub curve concept. 13,K2,CO4

OR

b) On what basis failure data is analysed? Explain the terms 'failure density' and 'failure rate' in detail. 13,K2,CO4

15. a) Two units of a system, A and B have reliabilities of 0.9 and 0.50 respectively. Determine the reliability for the following configurations: (i) A and B are cascaded (ii) A and B are cascaded and Redundant (iii) A and B are cascaded and only B as Redundant. (iv) A and B are cascaded and the cascaded combinations has group redundancy. 13,K2,CO6

OR

b) How a designer is expected to design for (a) Reliability, and (b) Maintainability? How a designer should trade-off between Reliability and Maintainability on one side and cost on the other side? 13,K2,CO6

PART - C (1 × 15 = 15 Marks)

16. a) How will you find out reliability of systems connected in series and parallel combined? Explain with help of neat sketches. 15,K2,CO5

OR

b) Calculate the system reliability of an equipment that is to operate for 500 hours and which consists of four sub systems having the following MTBF values 15,K2,CO5
Subsystem A-5000 hours
Subsystem B-3000 hours
Subsystem C-15000 hours
Subsystem D-15000 hours