M.E. PRODUCTION ENGINEERING FIRST YEAR FIRST SEMESTER EXAM 2025

QUALITY ENGINEERING & MANAGEMENT

(Use separate answer script for each part)

Time : Three hours **Part I (60 Marks)** Full Marks : 100

(Answer any three questions)

1.(a) State why 3-sigma limits are used for developing control charts? (5)

(b) A fair percentage of a certain product requires costly rework operations to change a certain quality characteristic after the final product has been rejected by the manufacturer's 100% final inspection. Rework is possible whenever the values of this quality characteristic falls above the upper specification limit. If the value falls below the lower specification limit, the product must be scrapped.
X-bar and R control charts have been initiated and maintained for 50 sub-groups of 5 each with samples taken production every 2 hours. The specification requirements for the measured quality are 119±10 and σ is 5. On the assumption that the quality characteristic is normally distributed, what percentage of defective product is being produced? How much of this can be reworked? (Assume process mean = 124, $\phi(1) = 0.8413$, $\phi(-3) = 0.00135$) (15)

2.(a) A manufacturer purchases small bolts in cartons that usually contain several thousand bolts. Each shipment consists of a number of cartons. As a part of the acceptance procedure for these bolts, 400 bolts are selected at random from each carton and are subjected to visual inspection for certain defects. In a shipment of 10 cartons, the respective percentage defectives in the samples from each carton are 0, 0, 0.5, 0.75, 0, 2.0, 0.25, 0, 0.25 and 1.15. Does the shipment of bolts appear to exhibit statistical control with respect to the quality characteristic examined in this inspection? (10)

(b) Describe the sequential sampling plan. (5)

(c) Mention five industrial applications of c-chart. (5)

3.(a) Write short notes on (i) Cause and effect diagram, (b) Pareto chart (5x2)

(b) For a given single sampling plan, N = 1000, n = 50, c = 1 have been given. Now, find the values of probability of acceptance, AOQ and AOQL for the lots containing 1%, 2%, 5%, 10% and 15% defective items. (10)

4.(a) While conducting experiments using Taguchi' orthogonal array, how an appropriate design plan can be selected? Why the array is known as orthogonal? Describe a linear graph. (4+2+4)

(b) What is cost of quality? Describe in detail each component of cost of quality. (2+8)

5.(a) Describe in detail Deming's approach to quality improvement. (10)

(b) State Kaizen's 5-S movement to quality improvement. (10)

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Full Marks : 100 Time: Three Hour

PART-II (40 Marks)

Answer each part in separate answer script.

Answer any TWO Questions

6. a) What do you understand by " Total Quality Management". State the benefits of it.
   b) Explain that TQM is a cultural revolution.
   c) Make comparisons between TQM and Traditional approach.

(6+4+10)

7. a) What is DPMO ? Mention the it's value allowed in 3-Sigma and 6-Sigma processes?
   b) Distinguish between DMAIC and DMADV.
   c) Write down the steps of DMAIC
   d) What are the various wastes as per Just In Time Philosophy?

(4+4+7+5)

8. a)What do you understand by TQM Culture?
   b) What are the steps and benefits obtained from Brainstorming Session?
   c) What do you understand by Benchmarking? Discuss on the process of benchmarking.

(5+7+8)

9. a) What is PDCA cycle? Who has proposed it?
   b) What is the concept of Zero Defects? Who has proposed it?
   c) What is KAIZEN ? Who has proposed it? Why is it so important for TQM?
   d) What are the ten steps towards quality improvement proposed by Dr. Juran?
   e) Write down a short note on ISO Quality System?

(3+3+4+5+5)
