

USN

| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|

CMRIT LIBRARY
BANGALORE - 560 037

10ME668

Sixth Semester B.E. Degree Examination, June/July 2018
Statistical Quality Control

Time: 3 hrs.

Max. Marks:100

- Note: 1. Answer FIVE full questions, selecting at least TWO questions from each part.**
2. Use of SQC Tables are permitted.

PART – A

- 1 a. Define quality? What are the objectives of Quality control? (08 Marks)
b. List different methods for statistical quality improvement. (04 Marks)
c. What are quality costs? Explain briefly the different quality costs. (08 Marks)
- 2 a. Five thermostatic controls are tested to determine the 'ON' temperature. The measured values are 344°, 338°, 342°, 335°, 336°. These value constitute the first sub group for certain control chart. Compute the mean, median for this group. (04 Marks)
b. The average weight of 100 screws in box 'A' is 10.4 gms. It is mixed with 150 screws of box 'B'. The average weight of mixed screws is 10.9 gms. Find the average weight of screws of Box 'B'. (04 Marks)
c. Maruti produces a automobile component having a mean diameter of 2.498 cm with standard deviation of 0.013 cm.
(i) Determine the number of % of components to be scrapped.
(ii) Determine the number of % of components to be reworked.
(iii) Determine the number of % of acceptable items meeting the components specification. Specification : 2.5 ± 0.025 cm and 10000 components are under study. (12 Marks)
- 3 a. What is meant by variation? Briefly explain various factors responsible for variation. (10 Marks)
b. What is a control chart? Briefly explain Trend, Cluster, Cycle pattern of Run Pattern's on control chart. (10 Marks)
- 4 In a SQC study of a lathe in turning a shaft of diameter 23.75 ± 0.1 mm. A sample of 6 consecutive pieces was taken on each day for 8 days. Diameters of the shaft are as given below:
(i) Determine \bar{X} and \bar{R} . (04 Marks)
(ii) Compute the '3 σ ' control limits for \bar{X} and R-charts. (06 Marks)
(iii) Construct the \bar{X} and R-chart and comment on the ability of the process. (06 Marks)
(iv) Determine '6 σ ' and comment on the ability of process to meet specification limit or not. (04 Marks)

Diameters of shaft in mm are:

| 1 st day | 2 nd day | 3 rd day | 4 th day | 5 th day | 6 th day | 7 th day | 8 th day |
|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| 23.77 | 23.8 | 23.77 | 23.79 | 23.75 | 23.78 | 23.76 | 23.76 |
| 23.80 | 23.78 | 23.78 | 23.76 | 23.78 | 23.76 | 23.78 | 23.79 |
| 23.78 | 23.76 | 23.77 | 23.79 | 23.78 | 23.73 | 23.75 | 23.77 |
| 23.73 | 23.70 | 23.77 | 23.79 | 23.77 | 23.76 | 23.76 | 23.72 |
| 23.76 | 23.81 | 23.80 | 23.82 | 23.76 | 23.74 | 23.81 | 23.78 |
| 23.75 | 23.77 | 23.74 | 23.76 | 23.79 | 23.78 | 23.80 | 23.78 |

- 5 a. Explain : (i) Process capability (ii) UNTL (iii) LNTL (iv) Process performance index. (08 Marks)
- b. The probability that Razor blades manufactured by a firm are defective is 1 of 500. Blades are supplied with 5 each. In a lot of 10,000 packets, how many packets would:
- Be free of defective blades.
 - Contain exactly one defective blade.
 - Contain at least 3 defective blades.
 - Contain 5 or more defective blades. (12 Marks)

- 6 a. Differentiate between C-chart of V-chart. (05 Marks)
- b. The inspection results in a machine shop based on a sample size of 50 are given below:
- Calculate the '3 σ ' control limits for P-chart.
 - Plot the data and offer your comment's on the behavior of the process.
 - What standard fraction defective would you recommend for the future period?

| | | | | | | | | | | |
|----------------------|---|---|---|---|----|---|---|---|---|----|
| Sample No: | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| No. of defect's (d): | 6 | 3 | 1 | 2 | 12 | 6 | 4 | 7 | 1 | 8 |

| | | | | | | | | | | |
|----------------------|----|----|----|----|----|----|----|----|----|----|
| Sample No: | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| No. of defect's (d): | 3 | 7 | 1 | 15 | 4 | 18 | 3 | 2 | 6 | 7 |

(15 Marks)

- 7 a. Differentiate between Type A and Type B operating characteristic (OC) curves. (05 Marks)
- b. A single sampling plan is as follows: $N = 5000$; $n = 80$; $C = 2$
- Plot the OC curve for the above plan.
 - What is the producer's risk if AQL is 1.5%.
 - What is the consumers risk if LTPD is 4.5%.
 - What is the ATI of the above plan at 1.25% defective of the incoming lot?
 - Plot the AOQ curve and determine the AOQL. (15 Marks)

- 8 Write short notes on:
- CUSUM control chart.
 - EWMA control chart.
 - Sequential sampling plan.
 - Dodge-Romig sampling plan. (20 Marks)
