USN ☐☐☐☐☐☐☐☐☐☐

10ME668

Sixth Semester B.E. Degree Examination, June/July 2017
Statistical Quality Control

Time: 3 hrs. Max. Marks:100

Note: 1. *Answer FIVE full questions, selecting at least TWO questions from each part.*
 2. *Statistical Table Permitted.*

PART – A

1 a. Define Quality. Discuss different dimensions of quality. (06 Marks)
   b. Explain basic tools of Quality control and improvement. (07 Marks)
   c. Define Total Quality Management. Discuss components of Quality cost and effect of TQM on Quality cost. (07 Marks)

2 a. Explain Normal Distribution curve. (04 Marks)
   b. Explain Deming's Funnel experiment. (08 Marks)
   c. Assume the life of an electronic component is random variable following normal distribution with mean 5600 hours and standard deviation of 840 hours. (08 Marks)
      i) Determine percentage components having life between 5000-6200 hours.
      ii) What percentage of components will be above 4000 hours and below 3500 hours?

3 a. Discuss with Figure, different pattern of variation on control chart. (08 Marks)
   b. Explain significance of control chart. Differentiate between change and assignable cause of variation giving suitable example. (06 Marks)
   c. Write short note on :
      i) Warning limits
      ii) Average Run Length (ARL). (06 Marks)

4 a. Explain Type I and Type II error and discuss limitations of $\overline{X} - R$ chart. (06 Marks)
   b. Control chart for following data to be established sample of 5 have been taken every one hour. Specification requirement 12 ± 2.

Sample No.	Mean ($\overline{X}$)	Range (R)	Sample No.	Mean ($\overline{X}$)	Range (R)
1	11.7	1.9	11	11.7	1.8
2	11.7	3.4	12	12.8	2.8
3	11.9	1.0	13	12.0	2.5
4	12.2	1.3	14	11.8	0.9
5	11.0	1.9	15	12.2	3.2
6	12.7	2.5	16	12.4	1.6
7	12.0	2.6	17	12.6	2.7
8	12.1	2.1	18	12.4	1.7
9	12.6	2.2	19	13.5	1.4
10	12.1	1.2	20	11.7	2.3

   i) Construct $\overline{X} = R$ chart and interprete the state of control
   ii) Determine C_p and C_{pk}. (14 Marks)

PART – B

5 a. Define process capability and explain different process capability indices. **(08 Marks)**

b. Control charts for $\overline{X} = R$ charts are to be maintained on certain dimensions of which specification is $33 \pm 5 \sum \overline{X} = 669.2$ and $\sum R = 126$ after 20 subgroups of size 5.
   - i) Determine trial control limits for $\overline{X}$ - R chart
   - ii) What is process capability (C_p)?
   - iii) Determine percentage rejection if any. **(12 Marks)**

6 a. List differences between control chat for variable and attribute. **(04 Marks)**

b. Discuss purpose of P-chart and steps in construction. **(06 Marks)**

c. Following table gives number of missing rivets noted in aircraft final inspection. Compute trial control limits and plot chart. **(10 Marks)**

Aircraft No.	No. of missing rivets	Aircraft No.	No. of missing rivets	Aircraft No.	No. of missing rivets.
1	8	10	12	19	11
2	16	11	23	20	9
3	14	12	16	21	10
4	19	13	9	22	22
5	11	14	25	23	7
6	15	15	15	24	28
7	8	16	9	25	9
8	11	17	9		
9	21	18	14		

7 a. Explain characteristics of OC curve. **(04 Marks)**

b. Discuss procedure for Double sampling plan. **(06 Marks)**

c. Design single sampling plan for N = 5000, n = 80, C = 2. **(10 Marks)**
   - i) Plot OC curve
   - ii) What is producer risk if AQL = 1.5% and consumer risk if LTPD = 4.5%?

8 a. List characteristics, advantages and disadvantages of good acceptance sampling plan. **(08 Marks)**

b. Write note on :
   - i) Cumulative sum control chart
   - ii) Design of EWMA control chart. **(12 Marks)**

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