CBCS SCHEME

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18MA55

Fifth Semester B.E. Degree Examination, Feb./Mar. 2022
Statistical Quality Control

Time: 3 hrs. Max. Marks: 100

Note: **1.** ***Answer any FIVE full questions, choosing ONE full question from each module.***
2. ***Use of SQC tables is permitted.***

Module-1

1 a. Define Quality. Explain what are the dimensions of quality? **(10 Marks)**

b. Explain four categories of quality costs. **(10 Marks)**

OR

2 a. Explain the three statistical methods for quality improvements. **(10 Marks)**

b. Define "Quality Assurance". List important activities of QA department in an industry. **(10 Marks)**

Module-2

3 a. Compare controls charts for variables with control charts for attributes. **(10 Marks)**

b. A sub group of 5 items each are taken from a manufacturing process at a regular interval. A certain quality characteristics is measured and $\overline{X}$ and R values computed. After 25 groups it is found that $\sum \overline{X} = 357.50$ and $\sum R = 8.80$. If the specification limits are 14.40 ± 0.40 and if the process is in statistical control what conclusion can you drawn about the ability of the process to produce items within specifications.
[for sub group of 5 items $d_2 = 2.326$] **(10 Marks)**

OR

4 a. Differentiate between : (i) p and np chart. (ii) C and U chart. **(10 Marks)**

b. The inspection results in a machine shop based on sampling size of 50 are given below:
(i) Calculate the control limits for the P-chart using 3σ limits.
(ii) Plot the data and offer your comments on the behavior of the process.
(iii) What standard fraction defective would you recommended for the future period?

Sample No.	No. of defectives (d)	Sample No.	No. of defectives (d)
1	6	11	3
2	3	12	7
3	1	13	1
4	2	14	15
5	12	15	4
6	6	16	18
7	4	17	3
8	7	18	2
9	1	19	6
10	8	20	7

(10 Marks)

Module-3

5 a. What do you mean by warning limits and action limits? Explain the use of warning limits. **(10 Marks)**

b. Explain the following:
(i) Modified control charts.
(ii) Moving average chart. **(10 Marks)**

OR

6 a. Test on shear strength of spot weld made by seven different machines gave the following results:

Machine	No. of tests	Average shear strength – kg X	Standard deviation
1	119	274	29
2	110	364	42
3	126	319	23
4	126	359	26
5	126	334	36
6	115	313	23
7	125	375	31
Total	847	2538	210

By using method with large sub-groups. Plot the $\overline{X}$ and σ charts to judge whether their clear evidence that the different machines represent different cause systems. Use simple unweighted average to determine $\overline{X}$ and σ and base your limits on average sub group size. **(10 Marks)**

b. Write short notes on:
(i) Cumulative sum control charts.
(ii) Design of a cusum chart and V-mask. **(10 Marks)**

Module-4

7 a. Name the various methods of calculating process capability. Explain why the "range method" is preferred for process capability analysis. **(10 Marks)**

b. Write short notes on:
(i) Principles of rational sub groups.
(ii) Six sigma concept of process capability. **(10 Marks)**

OR

8 a. Write briefly : (i) Process capability (ii) Seven OC tools. **(10 Marks)**

b. Determine the control limits for $\overline{X}$ and R chart, if $\sum \overline{X} = 357.50$, $\sum R = 9.90$. Number of subgroups = 20, it is given that, $A_2 = 0.18$, $D_3 = 1.59$ and $d_2 = 3.735$. Also find the process capability. **(10 Marks)**

Module-5

9 a. Write difference between sampling inspection and 100% inspection. **(05 Marks)**

b. With a block diagram, explain double sampling plan. **(05 Marks)**

c. A single sampling plan is as follows:
N = 4000, n = 75, C = 2
(i) Plot the OC curve.
(ii) If AQL is 1.5% find producer's risk and if consumer risk is 10%.
(iii) Plot the AOQ curve and determine AOQL.
(iv) Find the ATI of the above plan 1.5% defectives of the incoming lot. **(10 Marks)**

OR

10 a. Define producer's risk and consumers risk with a neat sketch of OC curve. **(05 Marks)**

b. List advantages, limitations and uses of sampling inspection. **(05 Marks)**

c. A double sampling plan is as follows:
N = 5000, $C_1 = 3$, $r_1 = 6$
$n_1 = 150$, $C_2 = 8$, $r_2 = 9$
$n_2 = 200$
100P' = 1.5, P' = 0.015
Find Pa, ATI, AOQ, ASN **(10 Marks)**

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