CBCS SCHEME

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15MA64

Sixth Semester B.E. Degree Examination, Dec.2018/Jan.2019
Statistical Quality Control

Time: 3 hrs. Max. Marks: 80

Note: 1. Answer any FIVE full questions, choosing one full question from each module.
2. Use of Statistical tables is permitted.
3. Missing data may be suitably assumed.

Module-1

1 a. Define quality? How do you evaluate the quality of a product? Explain. **(10 Marks)**

b. Clearly distinguish between inspection and quality control. **(06 Marks)**

OR

2 a. What is 'quality assurance function'? Explain activities assigned to the quality assurance function. **(08 Marks)**

b. Sketch and explain the economics of quality as applied to quality of products. **(08 Marks)**

Module-2

3 a. Clearly distinguish between the chance causes and assignable causes of variation by giving suitable examples. **(06 Marks)**

b. A shaft is turned on a lathe for a diameter of 23.75 ± 0.1mm. Average diameter and range is recorded for 8 days. A sample of six items were inspected per day.

Day	1st	2nd	3rd	4th	5th	6th	7th	8th
Average diameter	23.765	23.77	23.771	23.776	23.771	23.758	23.776	23.766
Range	0.07	0.11	0.06	0.08	0.04	0.05	0.06	0.07

Construct the average and Range chart. State whether the process is in control or not. **(10 Marks)**

OR

4 a. Explain the following :
i) Choice of variable
ii) Basic of subgrouping
iii) Sample size and frequency of sampling. **(06 Marks)**

b. Frozen orange juice concentrate is packed in 6.oz cardboard cans. These cans are formed on a machine by spinning 30 samples of n = 50 cans were inspected at half hour intervals over a three shift period in which the machine was in continuous operation. For the following data, set up a control chart for fraction of non conforming cans produced by this machine state whether the process is in control or not.

Sample number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Number of non conforming cans	12	15	8	10	4	7	16	9	14	10	5	6	17	12	22
Sample number	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Number of non conforming cans	8	10	5	13	11	20	18	24	15	9	12	7	13	9	6

(10 Marks)

Module-3

5 a. What do you mean by warning limits on control chart? Explain. **(06 Marks)**

b. A sample of 5 items each are taken from a manufacturing process at a regular interval. A certain quality characteristic is measured $\overline{X}$ and R values are computed. After 25 subgroups it is found that $\sum\overline{X}$ is 357.50 and $\sum R$ is 8.80. If the specification limits are 14.40 ± 0.40. State whether the process is in control or not. What conclusions can you draw about the ability of the process to produce items within specifications? **(10 Marks)**

OR

6 a. What is Cusum chart? What are its advantages over conventional control chart? **(06 Marks)**

b. The specifications for a certain quality characteristic are 220 ± 20. It is decided to initiate $\overline{X}$ and R control charts with the $\overline{X}$ chart based on reject limits. Past evidence shows that dispersion tends to remain constant with a 'σ' of about 9 units. The control chart is initiated with a sub group size of 4. In the first 50 subgroup no points on the R chart are outside the control limits. On the $\overline{X}$ chart 4 points are above the upper reject limit and 3 points are below the lower reject limit. Analyst concluded that process is "badly out of statistical control. Is this the type of case in which you would recommend the use of reject limits? Why or why not. **(10 Marks)**

Module-4

7 a. Explain the importance of process capability analysis. **(06 Marks)**

b. By taking suitable data, explain the process capability analysis using a histogram. **(10 Marks)**

OR

8 a. Control charts for $\overline{X}$ and R are maintained on certain dimensions of a manufactured part, measured in mm for 20 sub groups of 5 items each. The sum of $\overline{X}$ is 909.17 and sum of R is 6.250 after 20 subgroups. Set up an $\overline{X}$ chart and R chart. Also find process capability and comment on the process. **(08 Marks)**

b. Explain:

i) Measuring gage capability

ii) Setting specification limits. **(08 Marks)**

Module-5

9 a. List the advantages and limitation of acceptance sampling. **(06 Marks)**

b. Draw the OC curve for the following single sampling plan. n = 300, c = 5 and assume fraction defective is varying from 0.5 to 4%. Determine the producer's risk and consumer's risk at 1% and 3% respectively. Also find AOQL. **(10 Marks)**

OR

10 a. Design a sequential sampling plan for the following specifications.

$\alpha = 0.05$, $P_1 = 0.10$

$\beta = 0.20$, $P_2 = 0.30$ Also determine

i) AOQ when $P^1 = P_1$

ii) Minimum number of items inspected for accepting the lot

iii) Minimum number of defectives for rejection of the lot

iv) Average number of items inspected when the quality of the lot is P_1. **(10 Marks)**

b. Explain :

i) Consumer's risk

ii) Producer's risk **(06 Marks)**

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