CBCS SCHEME

USN | | | | | | | | | | |

17MA73

Seventh Semester B.E. Degree Examination, Jan./Feb. 2021
Statistical Quality Control

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Statistical tables are permitted to use.

Module-1

1 a. Define the term "Quality Control" and explain its advantages over inspection techniques. **(10 Marks)**

b. Explain the term "Quality Assurance Function", and state the activities assigned to it. **(10 Marks)**

OR

2 a. Briefly discuss the dimensions of quality. **(10 Marks)**

b. Explain the following as applied to quality control:
i) Appraisal cost
ii) Prevention cost
iii) Failure cost
iv) Optimum cost. **(10 Marks)**

Module-2

3 a. Differentiate between the chance causes and assignable causes of variation giving suitable examples. **(10 Marks)**

b. Control chart for $\overline{X}$ and R are maintained on a certain dimensions of a manufactured part measured in mm. The subgroup size is 4. The value of $\overline{X}$ and R are computed for each subgroup. After 20 subgroups $\Sigma\overline{X} = 412.83$ and $\Sigma R = 3.39$. Compute the values of 3 sigma limits for $\overline{X}$ and R charts and estimate the value of 'τ' on the assumption that the process is in statistical control. **(10 Marks)**

OR

4 a. How do you compare P chart with $\overline{X}$ and R chart? **(05 Marks)**

b. Distinguish between P chart and C chart. **(05 Marks)**

c. A factory manufacturing small bolts. To check the quality of bolts, the manufacture selected 20 samples of some site 100 from the manufacturing process time to time.

Data

Sample Number	1	2	3	4	5	6	7	8	9	10
Proportion defective	0.10	0.04	0.08	0.15	0.08	0	0.01	0.05	0.05	0.08
Sample No.	11	12	13	14	15	16	17	18	19	20
Proportion defective	0.10	0	0.06	0.05	0.03	0.20	0.05	0.07	0.01	0.08

Estimate the proportion defective of the process. Does the process appear to be under control with respect to the proportion of defective bolts? **(10 Marks)**

Module-3

5 a. What do you mean by warning limits and action limits? **(05 Marks)**

b. The specifications for a certain quality characteristic are 220 ± 20. Take $\sigma' = 9$, with subgroup size of 4. In the first subgroups no points on the R chart are outside the control limits. On the X-chart 4 points are above the upper reject limit and 3 points are below the lower reject limit. Establish $\overline{X}$ and R Reject limits. Discuss with reference to control chart principles. **(15 Marks)**

OR

6 Explain about
- i) Cusum chart
- ii) Normal probability plot
- iii) $\overline{X}$-chart with steady trend in universe average
- iv) Moving average and range control limits. **(20 Marks)**

Module-4

7 a. Explain about process capability measurements. **(10 Marks)**

b. The design specifications for a component are 100 ± 0.5mm, where as the process report shows that process average is 99.9mm and standard deviation is 0.18. Do these figures call for any action by any one? What action is necessary and by whom? **(10 Marks)**

OR

8 Explain about:
- i) Gauge capability
- ii) Process capability by using Histogram
- iii) Process stability
- iv) Probability plots. **(20 Marks)**

Module-5

9 a. What is meant by sampling inspection by attributes? **(05 Marks)**

b. Define producer and consumer's risk on operating characteristics curve. **(05 Marks)**

c. A single sampling plan use a sample size of 15 and an acceptance number 1. Using hypergeometric probabilities, compute the probability of acceptance of lots of 50 articles 2% defective. **(10 Marks)**

OR

10 a. State the difference between single sampling plan and double sampling plan. **(05 Marks)**

b. What is an item by item sequential sampling plan? **(05 Marks)**

c. Explain the characteristics of OC curves. **(10 Marks)**

* * * * *