**19P364**                         (Pages: 2)                    Name……………………..

                                                                Reg. No…………………..

### THIRD SEMESTER M.Sc. DEGREE EXAMINATION, NOVEMBER 2020
(CBCSS-PG)
### CC19P ST3 E10 - STATISTICAL QUALITY CONTROL
(Statistics)

(2019 Admission Regular)

Time: Three Hours                                              Maximum: 30 Weightage

### PART A
Answer any *four* questions. Each question carries 2 weightage.

1. Define quality and quality assurance. Explain dimensions of quality.

2. What is meant by lot disposition? Compare various approaches for lot disposition.

3. Derive operating characteristic function for a variable sampling plan with single specification limit when the quality characteristics are normally distributed and population variance is known.

4. The number of nonconforming switches in samples of size 150 are shown in Table. Construct a control chart for fraction of nonconforming units using these data. Does the process appear to be in control?

| Sample number | No. of non-conforming units | Sample number | No. of non- conforming units |
|---|---|---|---|
| 1 | 3 | 11 | 6 |
| 2 | 4 | 12 | 4 |
| 3 | 0 | 13 | 0 |
| 4 | 1 | 14 | 4 |
| 5 | 3 | 15 | 5 |
| 6 | 2 | 16 | 1 |
| 7 | 5 | 17 | 4 |
| 8 | 1 | 18 | 5 |
| 9 | 5 | 19 | 5 |
| 10 | 2 | 20 | 2 |

5. Explain rational subgroups. What is the significance of average run length?

6. Explain process capability analysis?

7. Compare Shewhart control chart and Cusum chart.

**(4 × 2 = 8 Weightages)**

### PART B
Answer any *four* questions. Each question carries 3 weightage.

8. Explain double sampling plan. Derive the OC function of double sampling plan.

9. Explain item-by-item sequential sampling plan based on sequential probability ratio test.

10. Distinguish between CSP- I, CSP - II and CSP – III plans.

11. The molecular weight of a particular polymer should fall between 2100 and 2350. It is assumed that the molecular weights are normally distributed. 50 samples of this material were analysed it is obtained that the sample mean = 2275 and the sample standard deviation = 60. Check whether the process is cantered at the midpoint of the specification limits.

12. Explain the construction of np charts for constant and varying sample sizes.

13. Describe the statistical principle behind the control chart. Discuss various out of control patterns likely to be appear in a control chart?

14. Explain EWMA control charts.

**(4 × 3 = 12 Weightages)**

## PART C
Answer any *two* questions. Each question carries 5 weightage.

15. Explain single sampling plan for attributes. What are the advantages of single sampling plan over double sampling plan? Drive its performance measures.

16. Discuss the construction of sampling plan for variables when AQL and LTPD along with the consumer's and producer's risk are given.

17. (a) Construct control chart of mean and range for the following data and comment on the state of control.

    (b) Derive ARL of mean chart.

| Sample No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample values | 41 | 45 | 66 | 37 | 56 | 76 | 87 | 45 | 44 | 66 | 85 | 66 |
| | 64 | 53 | 82 | 87 | 99 | 89 | 57 | 78 | 78 | 54 | 57 | 120 |
| | 43 | 75 | 35 | 60 | 46 | 58 | 39 | 34 | 98 | 45 | 77 | 35 |
| | 71 | 89 | 45 | 79 | 77 | 48 | 119 | 98 | 39 | 89 | 55 | 55 |
| | 83 | 44 | 74 | 66 | 44 | 40 | 56 | 67 | 65 | 64 | 97 | 67 |

18. Describe cusum chart. Explain tabular cusum method and V mask procedure.

**(2 × 5 = 10 Weightages)**

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