LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – **STATISTICS**

THIRD SEMESTER – **NOVEMBER 2023**

PST 3503 – STATISTICAL QUALITY CONTROL

Date: 04-11-2023 Dept. No. Max. : 100 Marks

Time: 01:00 PM - 04:00 PM

SECTION – A

Answer ALL the questions. (10X 2 = 20)

1. Define quality.
2. Distinguish between non-conforming units and non-conformity.
3. When do we use a CV control chart?
4. Why do we prefer the EWMA control chart to the Shewart control chart?
5. What are the primary techniques used in process capability analysis?
6. Define process capability ratio.
7. What are the uses of acceptance sampling?
8. Define AOQL.
9. What is Six Sigma?
10. What is the definition of DPMO or DPPM?

SECTION- B

Answer any FIVE questions. (5X 8 = 40)

11. Obtain the control limits for $\bar{X}$ and R charts.
12. Describe the various patterns in the control chart.
13. Explain the tabular CUSUM for monitoring the process mean.
14. Explain the multivariate control charts by using Hotelling T^2 and chi-square.
15. A process is in statistical control with $\bar{\bar{X}} = 41.5$, $\bar{R} = 2.5$ and n = 3. Specifications are 40 ±5. The quality characteristic is normally distributed.
    a) Estimate the potential capability (b) Estimate the actual capability and obtain C_{pm}.
16. Explain the procedure for double sampling plans.
17. Draw the OC curve for a single sampling plan n=150 and c=2.
18. Explain Six Sigma and generations of Six Sigma implementations.

SECTION – C

Answer any TWO Questions. (2 X 20 = 40)

19. Briefly explain Deming's 14 points.
20. A fraction nonconforming control chart with $n = 100$ has the following parameters $UC = 0.161$, $CL = 0.0800$ and $LCL = 0$
    a) What would be the corresponding parameters for an equivalent control chart based on a number nonconforming? (4)
    b) Use the Poisson approximation to the binomial to find the probability of type I Error? (4)
    c) What is the probability that a shift in the process fraction nonconforming to 0.2 will be detected on the first sample following the shift? (4)
    d) What is the probability of detecting the shift in part(c) by at most the fourth sample after the shift? (4)
    e) Discuss the OC function and ARL for p chart. (4)

21. a) Setup an EWMA control chart for the process mean with the target value $\mu = 8, \sigma = 1, \lambda = 0.2$ and L = 3 to the data given below and interpret the result. 14)

i	1	2	3	4	5	6	7	8	9	10
X	8.00	8.01	8.02	8.01	8.00	8.01	8.06	8.07	8.01	8.04

b) Explain the uses of C_p, C_{pk} and C_{pm} with one example each. (6)

22. Explain the DMAIC procedure in detail.
