LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

THIRD SEMESTER – NOVEMBER 2016

ST 3817 - STATISTICAL QUALITY CONTROL

Date: 05-11-2016 Dept. No. Max. : 100 Marks

Time: 09:00-12:00

Part-A

Answer **ALL** the questions: **(10 X 2 = 20)**

1. Define Quality Improvement.
2. What is nominal and specification limits.
3. Distinguish between warning limits and action limits.
4. Define trial control limits.
5. When do you prefer p chart.
6. What is product characterization in process capability analysis?
7. Write the statistics for one sided upper and lower CUSUM.
8. Define multivariate quality control.
9. What is lot sentencing in acceptance sampling.
10. When do you prefer S chart to R chart?

Part-B

Answer any **FIVE** questions only: **(5 X 8 = 40)**

11. What are chance and assignable causes of variability? What part do they play in the operation and interpretation of a Shewhart control chart?
12. What are the major statistical methods for quality improvement?
13. Derive the control limits for $\bar{x}$ and s chart.
14. Discuss the advantages of using control charts? How do you choose rational subgroups?
15. Explain the role of Design of Experiment in SPC.
16. Explain double sampling plan and obtain the expression for AOQ and ATI.
17. Discuss the purpose of cumulative sum chart .
18. Explain the multivariate control charts by using Hotelling T^2 and chi-square.

Part-C

Answer any **TWO** questions: **(2 x20 = 40)**

19. a) State Deming's 14 points.

b) The following fraction nonconforming control chart with n= 100 is used control a process UCL = 0.0750

CL = 0.0400

LCL = 0.0050

i) Use the Poisson approximation to the binomial to find the probability of type I error.

ii) Use the Poisson approximation to the binomial to find the probability of a type II error, if the true process fraction nonconforming is 0.0600.

iii) Draw OC curve for this control chart

iv) Find the ARL when the process is in control and the ARL when the process fraction nonconforming is 0.0600.

20.a) Explain process capability analysis with an illustration.

b) A process is in control with $\bar{\bar{X}} = 75$ and $\bar{S} = 2$. The process specifications are at 80 ± 8.

The sample size n = 5.

i) Estimate the potential capability.

ii) Estimate the actual capability.

iii) How much the process fallout be reduced by shifting the mean to the nominal dimension? Assume that the quality characteristic is normally distributed.

21. a) Derive the control limits for EWMA chart .

b) Set up an EWMA control chart for the process mean with the target value $\mu_0 = 10$, $\sigma = 1$, $\lambda = 0.10$ and L = 3 to the data given below and interpret the result.

i	1	2	3	4	5	6	7	8	9	10
x_i	9.45	7.99	9.29	11.66	12.16	10.18	8.04	11.46	9.2	10.34

22. a) What are continuous sampling plans? Mention a few situations where these plans are applied.

b) Explain the DMAIC procedure in detail.

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