LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

FIRST SEMESTER – **APRIL 2023**

PST1MC05 – STATISTICAL QUALITY CONTROL

Date: 05-05-2023 Dept. No. Max. : 100 Marks

Time: 09:00 AM - 12:00 NOON

SECTION A				
Answer ALL the questions				
1	**Answer the following**			**(5x1=5)**
a)	Define CTQ		K1	CO1
b)	Why do we prefer EWMA control chart over shewart control chart?		K1	CO1
c)	Define the one sided process capability ratio.		K1	CO1
d)	Under What situations acceptance sampling will be useful?		K1	CO1
e)	Define OC curve.		K1	CO1
2	**Match the following**			**(5x1=5)**
a)	Control Chart	k Method	K2	CO1
b)	EWMA chart	Double Sampling Plan	K2	CO1
c)	PCA	Shehwhart	K2	CO1
d)	Attribute sampling plan	Actual capability	K2	CO1
e)	Variable sampling plan	Small shift	K2	CO1
SECTION B				
	Answer any THREE of the following			**(3x10=30)**
3	What are chance and assignable causes of variability? What part do they play in the operation and interpretation of a Shewhart control chart?		K3	CO2
4	Explain the Multivariate control chart.		K3	CO2
5	Explain the uses of C_p, C_{pk} and C_{pm} with example.		K3	CO2
6	Describe Chain sampling plans with illustrations and also write few situations where these plans are applied.		K3	CO2
7	Explain the acceptance sampling by variables with its advantages and disadvantages.		K3	CO2

SECTION C

	Answer any TWO of the following	**(2x12.5=25)**	
8	a) What are the eight components of Quality? (4) b) What are the major statistical methods used for quality improvement? (6.5)	K4	CO3
9	Set up a EWMA control chart using μ=10,σ=1, λ=0.1 and L=2.7 and draw conclusion for the following data 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 8.08 11.46 9.2 10.34	K4	CO3
10	How do you estimate the natural tolerance limit of a process? Explain.	K4	CO3
11	What are the types of sampling plan available in variable sampling plan? Explain.	K4	CO3

SECTION D

	Answer any ONE of the following	**(1x15=15)**	
12	Specify the ways to represent CUSUM for monitoring the process mean.	K5	CO4
13	Elucidate double sampling plan and obtain the expression for average outgoing quality and average total inspection.	K5	CO4

SECTION E

	Answer any ONE of the following	**(1x20=20)**	
14	**a)** Obtain the control limits for *X bar* and R charts. **(6)** b) A process in controlled with a fraction nonconforming control chart with 3σ control limits, n=50, UCL=0.173 and LCL=0. construct an OC curve as function of the process average proportion nonconforming **(8)** c) Explain multiple sampling plan. **(6)**	K6	CO5
15	a) A process is in statistical control with $\bar{\bar{x}} = 75$ and $\bar{s} = 2$ The control chart uses a sample size of $n = 4$. Specifications are at 80 ± 8. The quality characteristic is normally distributed. i) Determine the potential capability of the process **(3)** ii) Determine the actual process capability. **(3)** iii) How much improvement could be made in process performance if the mean could be entered at the nominal value? **(9)** b) Draw the flowchart for CSP-1 **(5)**	K6	CO5

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