Roll No. | | | | | | | | | | | | | Total No. of Pages : 03

Total No. of Questions : 07

B.Tech (Ind. Engg. & Mgt.) (Spl. in TQM) (Sem.–4)

STATISTICAL QUALITY CONTROL

Subject Code : IEM-403

Paper ID : [61018]

Time : 3 Hrs. Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. **Attempt EIGHT out of TEN questions from SECTION-A carrying THREE marks each.**
2. **Attempt any FOUR out of SIX questions from SECTION-B carrying NINE marks each.**

SECTION-A

Q1. Answer briefly :

a. Write objectives of quality control.

b. Write scope of product audit.

c. What are the advantages of sampling? Discuss.

d. What do you mean by sampling for attributes?

e. Write objectives of bulk sampling.

f. What is average outgoing quality limit (AOQL)?

g. Discuss concept of variability.

h. Write purpose of process capability analysis.

i. Write importance of statistical process control.

j. Discuss benefits of control charts.

SECTION-B

Q2. A quality control inspector at Cocoa Fizz is using the data from Table 1 to develop control limits. If the average range for the twenty-five samples is .29 ounces (computed as 7.17/25) and the average mean of the observations is 15.95 ounces, develop three-sigma control limits for the bottling operation.

Q3. Three bagging machines at the Crunchy Potato Chip Company are being evaluated for their capability. The following data are recorded :

Bagging Machine	Standard Deviation
A	0.2
B	0.3
C	0.05

If specifications are set between 12.35 and 12.65 ounces, determine which of the machines are capable of producing within specification.

TABLE 1

Sample No.	Bottle volume in Ounces				Average ;	Range
	1	2	3	4	$\bar{X}$	R
1	15.85	16.02	15.83	15.93	15.91	.19
2	16.12	16.00	15.85	16.01	15.99	.27
3	16.00	15.91	15.94	15.83	15.92	.17
4	16.20	15.85	15.74	15.93	15.93	.46
5	15.74	15.86	16.21	16.10	15.98	.47
6	15.94	16.01	16.14	16.03	16.03	.20
7	15.75	16.21	16.01	15.86	15.86	.46
8	15.82	15.94	16.02	15.94	15.93	.20
9	16.04	15.98	15.83	15.98	15.86	.21
10	15.64	15.86	15.94	15.89	15.83	.30
11	16.11	16.00	16.01	15.82	15.99	.29
12	15.72	15.85	16.12	16.15	15.96	.43
13	15.85	15.76	15.74	15.98	15.83	.24
14	15.73	15.84	15:96	16.10	15.91	.37
15	16.20	16.01	16.10	15.89	16.05	.31
16	16.12	16.08	15.83	15.94	15.99	.29
17	16.01	15.93	15.81	15.68	15.86	.33
18	15.78	16.04	16.11	16.12	16.01	.34
19	15.84	15.92	16.05	16.12	15.98	.28
20	15.92	16.09	16.12	15.93	16.02	.20
21	16.11	16.02	16.00	15.88	16.00	.23
22	15.98	15.82	15.89	15.89	15.90	.16
23	16.05	15.73	15.73	15.93	15.86	.32
24	16.01	16.01	15.89	15.86	15.94	.15
25	16.08	15.78	15.92	15.98	15.94	.30
Total					398.75	7.17

Q4. Determine the control limits for $\bar{X}$ and R charts if $\sum \bar{X} = 357.50$, $\sum R = 9.90$, Number of subgroups = 20. It is given that $A_2 = 0.18$, $D_3 = 0.41$, $D_4 = 1.59$ and $D_2 = 3.735$. Also find the process capability.

Q5. A single sampling plan uses a sample size of 15 and an acceptance number 1. Using hypergeomertic probabilities, compute the probability of acceptance of lots of 50 articles 2% defective.

Q6. a) State and explain the advantages and limitations of acceptance sampling over 100% inspection.

b) Compare random sampling and stratified sampling .

Q7. a) A chart has been drawn showing the upper and lower specification limits. The average of samples of five are plotted on this chart. None of the points plotted on the chart lies outside specification limits.

Does the chart Show process under control? If not, explain why?

b) If the chart for averages shows a consistent shift in average level in any one direction, what conclusions would you draw and what action would you suggest?