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10ME668

Sixth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Statistical Quality Control

Time: 3 hrs.

Max. Marks:100

Note: 1. Answer FIVE full questions, selecting at least TWO questions from each part.
 2. Use of statistical tables is permitted.

PART – A

- 1 a. Explain quality of design and quality of conformance. (06 Marks)
- b. Write a note on statistical methods for quality control and improvement. (06 Marks)
- c. Explain the four categories of quality cost. (08 Marks)

- 2 a. Explain the three measures of central tendency. (06 Marks)
- b. Enumerate the characteristics (any four) of normal distribution curve. (06 Marks)
- c. The frequency distribution of resistance (in ohms) of 320 electric bulbs is given in the table below. Compute the mean resistance. (08 Marks)

Group Number	Resistance (in ohms)	Frequency
1	23.5 – 26.5	04
2	26.5 – 29.5	36
3	29.5 – 32.5	51
4	32.5 – 35.5	63
5	35.5 – 38.5	58
6	38.5 – 41.5	52
7	41.5 – 44.5	34
8	44.5 – 47.5	16
9	47.5 – 50.5	06

- 3 a. Explain 'Assignable' and 'Chance' causes of variation with example for each. (06 Marks)
- b. Explain the factors to be considered while deciding the 'sample size' for control charts for variables. (06 Marks)
- c. Write a note on "rational subgrouping". (08 Marks)

- 4 a. Explain in brief type – I and type – II errors. What are the remedies to reduce these types of errors? (08 Marks)
- b. The following table gives the sample averages and sample ranges of 10 samples of size 5 each. Compute three sigma trial control limits for \bar{X} and R – charts. What is your conclusion about the state of the process? Revise the control limits if necessary. (12 Marks)

Sample No	1	2	3	4	5	6	7	8	9	10
Average	476	443	458	451	460	465	448	452	450	449
Range	25	21	26	29	19	24	23	24	26	25

PART – B

- 5 a. Explain the process capability index (C_p) and process performance index (C_{pk}). (08 Marks)
 b. Certain type of cylinders are to be machined to a diameter of 12.50mm with a tolerance of ± 0.05 mm. If the process is centered at 12.50mm with a standard deviation of 0.02mm, is the process capable of meeting the specifications? What percentage of products must be scrapped and what percentage must be reworked? To what value the process average must be increased to eliminate the scrap. Then what percentage of products will have to be reworked? (12 Marks)
- 6 a. With block diagram, explain the double sampling plans. (06 Marks)
 b. Write a note on Dodge – Romig sampling plans. (06 Marks)
 c. In a double sampling plan $N = 5000$, $n_1 = 100$, $C_1 = 0$, $n_2 = 100$, $C_2 = 2$.
 i) Compute the probability of acceptance of 1% defective lot. (08 Marks)
 ii) Compute Average Total Inspection (ATI).
- 7 a. Define defects, defectives and fraction defective. (06 Marks)
 b. List any four differences between control charts for variables and control charts for attributes. (06 Marks)
 c. In a manufacturing unit, 15 lots of size 400 units each are subjected to 100% inspection. The number of defectives found in each lot are given below. Compute 3-sigma trial control limits for np-chart and revise them if necessary.

Lot number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
No. of defectives	2	5	0	14	3	0	1	0	18	6	6	0	3	0	6

(08 Marks)

- 8 Explain the step – by – step procedure for drawing :
 a. CUSUM chart
 b. Exponentially Weighted Moving Average (EWMA) chart. (20 Marks)

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