Sixth Semester B.E. Degree Examination, Aug./Sept.2020
Statistical Quality Control

Time: 3 hrs.   Max. Marks:100

Note: Answer any FIVE full questions, selecting at least TWO questions from each part.

PART – A

1   a. Define the term quality and any two benefits of quality improvement.   **(03 Marks)**
    b. Explain brief history of quality of design and factors controlling quality of design. **(07 Marks)**
    c. Explain briefly the 'cost of quality'.   **(10 Marks)**

2   a. Explain Deming Funnel experiment.   **(06 Marks)**
    b. The height of six students in a class is as 1.7, 1.6, 1.5, 1.8, 2.0, 1.4 mts. Find the standard deviation of the height of the students.   **(04 Marks)**
    c. Tests have indicated that the tensile strengths of certain aluminum alloy averages 1785 kg/cm^2 with a standard deviation of 220 kg/cm^2. If the distribution is normal, what percentage of the casting will have
       (i) tensile strength less than 1400 kg/cm^2
       (ii) more than 1500.   **(10 Marks)**

3   Explain the following:
    a. Frequency histogram
    b. Frequency polygon
    c. Bar chart
    d. O give curve   **(20 Marks)**

4   a. Explain type I and type II errors with respect to control charts.   **(06 Marks)**
    b. Control chart for $\overline{X}$ and R are maintained on a certain dimensions of a manufactured part, measured in mm. The sub group size is 4. The values of $\overline{X}$ and R are computed for each subgroup. After 20 subgroups $\sum \overline{X} = 412.83$ and $\Sigma R = 3.39$. Compute the values of 3 sigma limits for the $\overline{X}$ and R charts and estimate the value of 'σ' on the assumption that the process is in statistical control.   **(14 Marks)**

PART – B

5   a. Explain the terms process capacity index and process performance index.   **(06 Marks)**
    b. A certain types of cylinders are ground to a diameter of 12.50 mm with a tolerance of 0.05 mm. If the process is centered at 12.50 mm and the dispersion is 0.02 mm, what percentage of product must be scraped and what percentage must be reworked? To what value the process centre has to be shifted to eliminate the scrap i.e. to make the scrap zero? What is the percentage of new rework?   **(14 Marks)**

6   a. Differentiate between control chart for variables and attributes.   **(04 Marks)**
    b. Differentiate between defect and defective.   **(04 Marks)**

c. A certain product is given 100% inspection as it manufactured and the resultant data are tabulated for every one hour as shown in Table.Q6(c) for 16 hours. Compute:
(i) Trial control chart for a chart
(ii) Draw the control chart
(iii) What conclusion can be drawn about the process from the data and the chart:

Hour	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
No unit 'n' inspected np	48	36	50	47	48	54	50	42	32	40	47	46	46	47	48	36
Number of defective units	5	5	0	5	3	3	0	1	5	2	2	4	1	0	3	0

(12 Marks)

7 a. Explain the OC (Operating Characteristic) curve. (06 Marks)
   b. The lot size N is 2000 in a certain AOQL inspection procedure. The desired AOQL of 2% can be obtained with any one of the 3 sampling plans. These are:
   (i) $n = 65, c = 2$ (ii) $n = 41, c = 1$ (iii) $n = 18, c = 0$
   If large number of lots 0.3% defective are submitted for acceptance, what will be the average number of units inspected per lot under each of these three sampling plans?

(14 Marks)

8 a. Explain the basic principles of cumulative sum chart for monitoring the process mean.
(10 Marks)
   b. Explain the design of EWMA control chart. (10 Marks)

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