

Roll No.

Total Pages : 05

BT-7/D-14

8753

STATISTICAL QUALITY CONTROL AND
RELIABILITY

ME-405-E

Time : Three Hours]

[Maximum Marks : 100

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

Unit I

1. (a) Differentiate between :
- (i) Cost of quality and value of quality 3
 - (ii) Inspection and quality control 3
 - (iii) Quality of design and quality of conformance. 3
 - (iv) Quality of conformance and quality of performance. 3
- (b) Justify the statement : "Quality is a new competitive weapon". Give examples. 8

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P.T.O.

2. (a) What are the barriers to 'TQM implementation' ? How are they overcome ?

10

- (b) Discuss various components adding cost in a quality system using optimizing quality cost curve.

10

Unit II

3. The data shown in Table 1 are \bar{x} and R values for 24 sample of size $n = 5$ taken from a process producing bearings. The measurements are made on the inside diameter of the bearing, with only the last three decimals recorded (i.e., 34.5 should be 0.50345).

20

- (a) Set up \bar{x} and R charts on this process. Does the process seem to be in statistical control ? If necessary, revise the trial control limits.
- (b) If specifications on this diameter are 0.5030 ± 0.0010 , find the percentage of non-conforming bearings produced by this

process. Assume that diameter is normally distributed.

Table-1

Bearing Diameter Data

| Sample Number | \bar{x} | R | Sample Number | \bar{x} | R |
|------------------|-----------|---|------------------|-----------|---|
| 1 | 34.5 | 3 | 13 | 35.4 | 8 |
| 2 | 34.2 | 4 | 14 | 34.0 | 6 |
| 3 | 31.6 | 4 | 15 | 37.1 | 5 |
| 4 | 31.5 | 4 | 16 | 34.9 | 7 |
| 5 | 35.0 | 5 | 17 | 33.5 | 4 |
| 6 | 34.1 | 6 | 18 | 31.7 | 3 |
| 7 | 32.6 | 4 | 19 | 34.0 | 8 |
| 8 | 33.8 | 3 | 20 | 35.1 | 4 |
| 9 | 34.8 | 7 | 21 | 33.7 | 2 |
| 10 | 33.6 | 8 | 22 | 32.8 | 1 |
| 11 | 31.9 | 3 | 23 | 33.5 | 3 |
| 12 | 38.6 | 9 | 24 | 34.2 | 2 |

4. (a) What are the various factors that the analyst must take into account while choosing between attributes and variables control charts. **10**
- (b) At the start of a control chart program, it is usually difficult to determine which product or process characteristics should be controlled and at which points in the process to apply control charts. Describe various Guidelines for Implementing Control Charts. **10**

Unit III

5. (a) Suppose that a product is shipped in lots of size $N = 5000$. The receiving inspection procedure used is single sampling with $n = 50$ and $c = 1$.
- (i) Draw the type-A OC curve for the plan.
- (ii) Draw the type-B OC curve for this plan and compare it to the type-A OC curve found in part (i).
- (iii) Which curve is appropriate for this situation. **10**

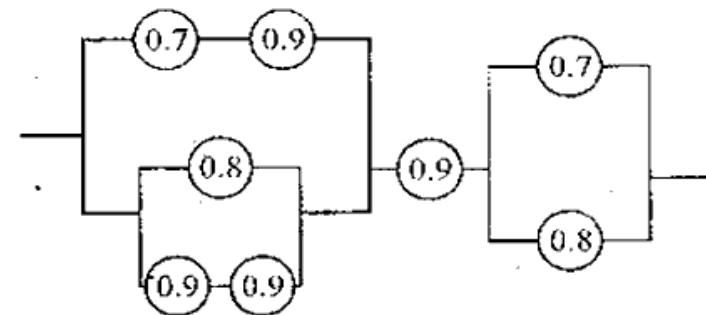
- (b) Differentiate between Single Sampling Plan and Double Sampling Plans. 10

6. (a) A product is shipped in lots of size $N = 2000$. Find a Dodge-Romig single-sampling plan for which the LTPD = 1%, assuming that the process average is 0.25% defective. Draw the OC curve and the ATI curve for this plan. What is the AOQL for this sampling plan ? 10
- (b) Compare Random Sampling and Stratified Sampling. 10

Unit IV

7. (a) State and explain various factors to be considered in designing for reliability. 10
- (b) Explain with examples how reliability is evaluated for the system with components connected in series, in parallel or in mixed system. 10

8. (a) Determine the overall reliability of the following system :



- (b) Describe various means to improve reliability. 10