Indian Statistical Institute, Bangalore
MS (QMS) First Year
Second Semester - Advanced Statistical Process Control

Midterm Exam — Date: April 24, 2023
Maximum marks: 60 — Duration: 3 hours

1. [4 + 10 + 2 = 16]

a) Define the procedure for item-by-item sequential sampling plan.

b) Derive the item-by-item sequential sampling plan for

$$\alpha = 0.05, p1 = 0.02, \beta = 0.10, p2 = 0.15$$

(Write down all necessary formulas for calculation).

If the reference single sampling plan is $n = 75, c = 3$; suggest the multiple sampling plan.

2. [3 + 12 = 15]

a) Explain the need for chain sampling plan.

b) Calculate AQL, LTPD, AOQL values for the plan

i) $n = 5, c = 0$ and

ii) $n = 5, i = 2$ (chain sampling plan)

(Write down necessary formulas used for calculation, compare the plans?)

3. [5 + 10 + 10 + 4 = 29]

a) Explain how to implement Taguchi's β-correction method.

b) Derive the β-correction factor for a continuous characteristics in a manufacturing process.

c) Compute the β-correction formula by using the following data.

5.204, 5.204, 5.217, 5.208, 5.221, 5.200, 5.221, 5.221, 5.213, 5.218, 5.218, 5.230, 5.239, 5.239, 5.300, 5.323

(Write down all calculation including the ANOA tables)

d) If the tolerance of the dimension is 5.230 ± 0.01; suggest the range of no correction.

4. [3 + 5 + 2 = 10]

a) Illustrate the CSP_1, CSP_2 and CSP_3 plans.

b) Compute the AOQL value for the following CSP_1 plan $i = 50, f = \frac{1}{3}$.

c) Compare the above CSP_1 plan with the single sampling plan n = 5, c = 0.

(Write all formulas and calculation).