Question Paper Code : 6391

M.Sc.(TQM) (Semester - II) Examination, 2018

[Fourth Paper]

PROCESS CAPABILITY ANALYSIS & QUALITY ASSURANCE

Time : Three Hours] **[Maximum Marks:70**

Note : Answer **five** questions in all. Question **No.1** is **compulsory**. Besides this, attempt **one** question from each unit.

1. Answer the following in brief : [3x10=30]

   (a) Advantages and disadvantages of sampling.

   (b) Ideal OC curve for sampling plan. What is Type - I and Type - II errors of this curve.

   (c) Impact of sample size on the OC curve. Disadvantages of having a sampling plan with C=0.

   (d) Explain Demings Kp rule.

   (e) Is it possible for a process to be in statistical control and still produce nonconforming items ? If so, describe a situation and suggest corrective actions.

(f) Explain 6 σ process. What is maximum number of nonconformities in the 6 σ process ? How this number is arrived at ?

(g) Total variability of measured observation is defined by variance (σ^2). Name the components that add to σ^2.

(h) Distinguish between producer's risk and consumer's risk. In this context, explain the accepatable quality level (AQL) and limiting quality level (LQL)

(i) Equations for acceptance and rejection lines are given below :

Acceptance d = -0.1 + 0.15n

Rejection d = 0.4 + 0.15n

Find the acceptance and rejection criteria for 0,1 & 2 defect.

(j) For Lot size of 500, 1.4% nonconforming, AOQL = 3%, Find the Dodge - Roming Sampling plan. What is LQL of this plan ?

(a) Parameter of sampling plan that meet the first condition exactly.

(b) Parameter of sampling plan that meet the second condition exactly

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average sample number for lots that are 1.5% nonconforming (use Grubbs Table) [10]

(b) Refer to Q.No. 7(a) above. For the double sampling planned as per the parameters calculated above, find the ASN and ATI when the AQL = 2%

UNIT-IV

8. The upper specification limit of coil resistance is 30ohms. The distribution of coil resistance is normal with standard deviation of 5 ohms. The batches that have a mean 2.3 standard deviation below the USL are to be accepted more than 95% of times and batches that have a mean one standard deviation below are to be accepted less than 8% of times. Find the parameters of a variable sampling plan and describe its operation. [10]

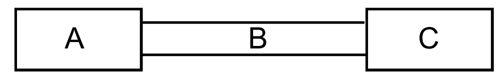
9. A cereal must have more than 25% of iron content. The standard deviation of iron content is 3%. It is preferred to accept the batches that are 1.5% nonconforming with a probability of 0.92. The batches that are 8% nonconforming are to be accepted with a probability of 0.12. Find :

UNIT-I

2. (a) Explain Cp and Cpk [10]

(b) For a process with Cpk = 0.7, define the upper and lower limits of nonconforming items produced by this process.

(c) A three component assembly is given below :



The mean length and natural tolerance of these items are given below :

	Mean length	
A	5mm	5mm ± .3mm
B	3mm	3mm ± .1mm
C	3mm	3mm ± .15mm

(i) Find the natural tolerance of assembly length

(ii) If the specification of assembly is 11±.2, calculate the proportion of assemblies nonconforming.

3. The specification of outside diameter of a shaft is 9 ± 0.1cm and inside diameter of bearing is 9.1 ± 0.1cm. Suppose the specification limits are equal

to natural tolerance of the process, calculate the proportion of unacceptable subassemblies, if clearance fit is desired between the shaft and bearing [10]

UNIT-II

4. (a) Single sampling plan with N = 1500, n = 150 and c = 3. Calculate the producer risk when acceptable quality level is 0.004 defective and consumer risk for limiting quality level of 0.06 defective. [10]

(b) Refer to question 4(a), calculate the ASN and ATI when the incoming quality is 0.02 defective.

5. For a double sampling plan N =3000, n_1 = 50 C_1 = 1, r_1=4, n_2 = 100, c_2 = 3, r_2 = 4. Find the Pa_1 Pa_2, Pr_1, Pr_2 for lot nonconforming (p=0.02)

(a) For, the above question find the ASN when p = .02 [10]

UNIT-III

6. (a) Find a sampling plan that satisfies producers risk of 5% for lots that are 2% nonconforming and consumer risk of 10% for 8% nonconforming lots.

Choose a sampling plan that has the smaller sample size and satisfies the producer's risk exactly . Based on this size of sample, calculate the quality of lot that is meeting the given consumer risk of 10% (use the table) [10]

(b) For lot size of N = 2000, a double sampling plan is made with n_1 = 50, n_2 = 100 is planned for a lot quality which is 3% nonconforming, the acceptance/rejection probabilities are given below :

Sample 1	Sample 2
Pa_1 = .60	Pa_2 = 0.25
Pr_1 = .10	Pr_2 = 0.05

Calculate the ASN, ATI & AOQ of this plan.

7. A double sampling plan is desired that has a producer/s risk of 5% for AQL = 1.5% nonconferming and a consumer risk of 10% for LQL = 10% non-conforming. The lot size is 1500, and the sample size of second sample is 2 times the sample size of first sample. Find the sampling plan if the producer's risk is to be satisfied exactly. Find the