*Name :* ............................................................

*Roll No. :* ............................................................

*Invigilator's Signature :* ...................................

**CS/M.Tech (ME)/SEM-1/MMT-104C/2010-11**

# 2010-11
# STATISTICAL PROCESS CONTROL

*Time Allotted :* 3 Hours　　　　　　　　*Full Marks :* 70

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words as far as practicable.*

## GROUP – A
### ( Short Answer Type Questions )

Answer any *two* of the following.　　2 × 5 = 10

1. What is the meaning of quality of design ? Explain the factors affecting the quality of design.

2. Describe briefly the 'Run Sum Test'.

3. What do you mean by variability ? Differentiate between the chance causes and assignable causes of variation giving suitable examples.

4. Differentiate between Total Quality Control and Total Quality Management.

## GROUP – B
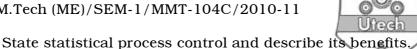### ( Short Answer Type Questions )

Answer any *three* of the following.　　3 × 5 = 15

5. What is meant by natural tolerance of the process ?

6. What are reject limits ? Explain the procedure for setting upper and lower reject limits.

7. State statistical process control and describe its benefits.

8. Differentiate between AQL and AOQL.

9. Explain the theorem of statistical tolerancing with suitable examples.

## GROUP – C

### ( Long Answer Type Questions )

Answer any *three* of the following. $3 \times 15 = 45$

10. a) Tests have indicated that the tensile strengths of certain aluminium alloy averages $1 \cdot 785 \text{ kg/cm}^2$ with a standard deviation of $220 \text{ kg/cm}^2$. If the distribution is normal what percentage of the casting will have

   i) tensile strength less than $1400 \text{ kg/cm}^2$

   ii) more than $1500 \text{ kg/cm}^2$ ?

   b) A random sample of 25 articles is taken from a stream of product 20% defective. What is the probability that the sample will contain exactly 5 defective ? $7 + 8$

11. 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 three sampling plans. These are :

   i) $n = 65, c = 2$

   ii) $n = 41, c = 1$

   iii) $n = 18, c = 0$.

   If a large number of lots $0 \cdot 3\%$ defective are submitted for acceptance, what will be the average number of units inspected per lot under each of these sampling plans ?

12. Define the term quality. Describe in detail the different quality dimensions. Explain the various steps taken in quality control programme. $3 + 8 + 4$

13. a) In a manufacturing process, the number of defectives found in the inspection of 15 lots of 400 items each are given below :

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

   i) Determine the trial control limits for np chart and state whether the process is in control.

   ii) What will be new value of mean fraction defective if some obvious points outside control limits are estimated ? What will be the corresponding upper and lower control limits ? Examine whether the process is still in control or not.

   b) Differentiate clearly between quality control and inspection. $11 + 4$

14. A certain product has been statistically controlled at a process average of 36·0 and a standard deviation of 1·00. The product is presently being sold to two users who have different specification requirements. User *A* has established a specification of 38·0 ± 4·0.

    a) Based on the present process set up, what per cent of the product produced will not meet the specifications set up by user *A* ?

    b) What per cent of the product will not meet the specifications of user *B* ?

    c) Assuming that the two users' needs are equal, a suggestion is made to shift the process target to 37·0. At this suggested value, what per cent of the product will not meet the specifications of user *A* ?

    d) At the suggested process target, what per cent of the product will not meet the specifications of user *B* ?

    e) Do you think that this shift to a process target of 37·0 would be desirable ? Explain your answer.

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