

*Full Marks : 70*

*Time : 3 hours*

**Answer Q. No. 1 and any five from the rest**

*The figures in the right-hand margin indicate marks*

*Draw neat sketch wherever necessary*

*Use of Poisson distribution table is permitted*

**1. Briefly answer all the following questions : 2 × 10**

- (a) Define concurrent engineering.
- (b) What is benchmarking ?
- (c) Differentiate between internal and external failure costs.
- (d) What is house of quality ?
- (e) Differentiate between common and special causes.

- (f) Give Taguchi's definition of quality.
- (g) Distinguish between variable and attribute.
- (h) What is SPC ?
- (i) With a flowchart explain the working of a double sampling plan.
- (j) Sketch an AOQ curve for 100% inspection.

- 2. (a) What is TQM ? How is it related to ISO 9000 ? 5
- (b) Distinguish between internal and external quality audit. 5
- 3. (a) What is kaizen ? How is it different from innovation ? 5
- (b) What are the benefits of quality system documentation ? 5
- 4. An  $\bar{X}$  chart has a centre line of 50 and is based on a false alarm rate of 0.5% and sample size of 4. The process variance is known to be 9. If the

process mean shifts from 50 to 55, what is the probability of detecting this shift on the very first sample taken following the shift? 10

5. A fraction non-conforming control chart has centre line at 0.02. What should be the sample size so that both the control limits will be positive? What would be the maximum value of upper control limit for a zero lower control limit? 10

6. What is the probability of accepting a lot of size 1000 containing on an average 1% non-conforming items if a single sampling plan with sample size 50, acceptance number 1 and rejection number 2 is followed? If rejected lots are subjected to 100% inspection, what will be ATI and ASN? 10

7. Explain working principle of 10  
 (a) EWMA chart  
 (b) Sequential sampling plan.

8. Write short notes on any two of the following : 10

(i) Re-engineering

(ii) Quality Circle

(iii) Six sigma.

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