

QUALITY ASSURANCE AND RELIABILITY

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 Normal and Poisson distribution tables is permitted

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

(a) Define Type-I error in a control chart.

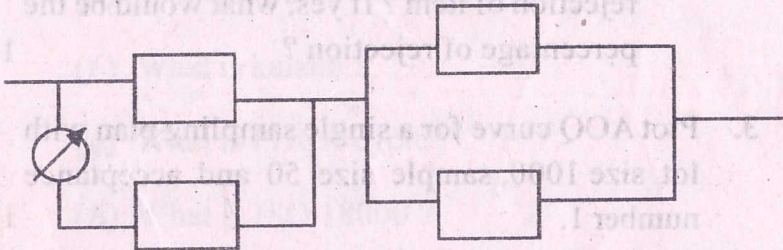
(b) For what value of process capability ratio there will be maximum percentage of rejection of items ?

(c) What would be ASN for a single sampling plan with sample size 100 and acceptance number 5 ?

- (d) Give Taguchi's definition of quality.
- (e) What is orthogonal array ?
- (f) What is kaizen ?
- (g) What is PDCA cycle ?
- (h) What is ISO 18000 ?
- (i) Mean cycles between failures is 100,000. What should be warranty period (in cycles) if the producer is willing to pay for repair of maximum 10% of devices ?
- (j) How is reliability different from quality ?
2. Samples each of size 4 are taken from a CNC machining centre at regular interval of one hour. After 20 samples, $\sum \bar{X} = 500$ and $\sum R = 20$. Customer specification limits are 25 ± 1 . For sample size of 4, take $c_2 = 0.79798$, $d_2 = 2.059$ and $A_2 = 0.729$.
- (a) What should be the control limits for \bar{X} chart so as to have a false alarm rate of 1% ?

- (b) If all the points plotted on \bar{X} chart are within the two control limits, will there be any rejection of item ? If yes, what would be the percentage of rejection ? 10
3. Plot AOQ curve for a single sampling plan with lot size 1000, sample size 50 and acceptance number 1. 10
4. (a) Explain the concept of Taguchi's method of robust design. 5
- (b) Operation on target is more important than conformance to specification in Taguchi's philosophy. Discuss. 5
5. Differentiate between : 10
- (i) Off-line and on-line quality control
- (ii) Inner array and outer array
- (iii) Signal and noise
- (iv) Full factorial design and partial factorial design.

6. What will be the system reliability for the assembly given below if the reliability of each component is 95%? Assume perfect switching. 10



7. (a) What is quality circle? Briefly describe the role of a facilitator of this circle. 5
- (b) What will be the probability of survival of an item till 100h of operation if its MTBF is 1000h? 5
8. Write short notes on any *two* of the following: 10
- (i) Quality Function Deployment
 - (ii) TQM
 - (iii) ISO 14000.