[03 – 4118]

IV/IV B.E. DEGREE EXAMINATION

First Semester

Mechanical Engineering

STATISTICAL QUALITY CONTROL

(Effective from the admitted batch of 2006–2007)

Time : Three hours Maximum : 70 marks

Question No. 1 is compulsory.

Answer any FOUR from the remaining.

All questions carry equal marks.

Answer to questions No. 1 must be at one place.

Use of statistical tables is permitted.

1. (a) Sum of Type-I and Type-II errors is equal to one. Do you agree or not? Why?

   (b) Name the control charts used for 'Off-line quality control'.

   (c) Explain the goal post philosophy used prior to Taguchi loss function approach.

   (d) What are appraisal costs?

   (e) What is out-of-control run length?

   (f) What is process capability ratio'?

   (g) How do you find ASN for a double sampling plan?

2. (a) How do you arrive at 3.4 ppm defectives in six sigma quality? (6)

(b) A quality engineer is given the option to choose a control chart from the following :

(i) $n = 5$ $h = 1$ hr $k = 2.99$

(ii) $n = 6$ $h = 2$ hr $k = 3.05$

If the engineer wants to choose the chart with minimum Type-I errors, what, should be his/her preference? (8)

3. (a) Distinguish between Variables and Attributes. (4)

(b) What is a standardized p-chart? Explain its construction and advantages. (10)

4. (a) What is $C_{pk}$? When is it preferred over $C_p$? Why? (4)

(b) A process is in control with $\bar{x} = 75$ and $\bar{s} = 2$. The process specifications are at $80 \pm 8$. The sample size $n = 5$.

(i) Estimate the potential capability

(ii) Estimate the actual capability. (10)

5. (a) Explain RQL and AQL. (4)

(b) Draw OC curve for the single sampling plan $n = 100$, $C = 2$. (10)

6. (a) Distinguish between ATI and ASN. (4)

(b) Find the ASN for the following double sampling plan if incoming quality is 2%

$n_1 = 100$ $c_1 = 1$ $r_1 = 4$

$n_2 = 100$ $c_2 = 4$ $r_2 = 5$ . (10)

7. Explain the Deming's philosophy. (14)

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

(a) Off-line quality control with suitable example.

(b) Process capability using control charts.

(c) Industrial applications of control charts.