IV/IV B.E. DEGREE EXAMINATION.
MECHANICAL ENGINEERING
FIRST SEMESTER
STATISTICAL QUALITY CONTROL
(Effective from the admitted batch of 2006-2007)

Time: 3 hours

Maximum: 70 marks

Question no. 1 is compulsory.
Answer any FOUR Questions from the remaining
All Questions carry equal marks.
Answer to Question no.1 must be at one place.
Use of statistical tables is permitted

1. a) What is quality cost?
   b) What is the difference between specification limits and control limits?
   c) What is standard deviation?
   d) What is process capability ratio?
   e) What is the Type – I error in control charts?
   f) Explain the use of control charts.
   g) Explain the construction of P – chart and C- chart?

2. Construct $\bar{X}$ and R chart for the following data on the basis of sample size 5.

Sample No	1	2	3	4	5	6	7	8	9	10	11	12
Sample average size	69.4	63.4	57.0	64.0	57.4	82.0	85.0	33.4	46.0	112.4	93.6	95.6
Sample range	45	48	62	48	36	81	78	42	69	84	48	75

3. a) Distinguish between specification and control ((or) action) limits. Show that the control limits can be used to improve the specification limits.

   b) The following table gives the number of missing air washers noted at air craft final inspection.

Air plane No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
No. of missing washers	10	11	09	08	12	07	20	16	13	14	15	12	18	25	26

Find $\bar{C}$, compute trail control limits, and plot control charts for C. What values of C would you suggest for the subsequent period?

4. a) Explain Taguchi's loss functions with help of an example.
   b) Discuss O.C curve.

5. a) What do you understand about the acceptance sampling procedures? State its uses giving illustrations.

   b) The following double sampling plan has been proposed for the given data.
      i) Select a sample of 2 from a lot of 20. If both articles inspected are good, accept the lot. If both are defective, reject the lot. If 1 is good and 1 is defective, take a second sample of one article.
      ii) If the article in the second sample is good, accept the lot. If it is defective reject the lot If a lot 25% defective is submitted, what is the probability of acceptance? Compute this by the method that is theoretically correct rather than an approximate method.

6. a) What is multiple sampling plan? Explain and what are its disadvantages?
   b) Discuss sequential sampling plan in detail.

7. a) Define tolerance fit. What is its use in process capability?
   b) What is meant by AOQ and AOQL?

8. Write short notes on any THREE of the following
   a) Type – I and Type – II errors in control charts.
   b) Rectifying inspection.
   c) Quality costs.
   d) U-charts