Reg. No.



## VI SEMESTER B.TECH (INDUSTRIAL AND PRODUCTION ENGINEERING) END SEMESTER EXAMINATIONS, JUNE 2017

## SUBJECT: QUALITY CONTROL AND RELIABILITY ENGINEERING

## [MME 3212]

## **REVISED CREDIT SYSTEM**

Time: 3 Hours

MAX. MARKS: 50

(03)

(03)

(02)

- ✤ Answer ALL the questions.
- Missing data may be suitably assumed.
- Use of SQC tables permitted.
- **1A.** What is Type II error with regard to control charts? How it is minimized? **(02)**
- **1B.** Explain the causes of quality variation.
- **1C.** Calculate mean, standard deviation, median and mode for the following frequency distribution:

Diameter (mm)	8	10	12	14	16	18	20
Frequency	25	40	67	35	23	7	3

- **2A.** Explain the inequality theorems. (03)
- **2B.** Explain the control chart for defects and rejects.
- **2C.** A double sampling plan is as follows:

 $n_1 = 150, c_1 = 2, n_2 = 300, c_2 = 3.$ 

Assuming the lot size is large in comarison to sample size, compute the probability of acceptance of a 2% defective lot. (04)

- **3A.** List the various tools used for quality control.
- 3B. Define Precision, Accuracy and Reproducibility with regard to method of measurement. (03)

- **3C.** A procedure for metal medallions and commemoration coins uses a *c* chart to control imperfections on large orders for single items. All imperfections are recorded but not all cause rejection and ultimate destruction of the item. Thirty items constitute an inspection unit. After 20 inspection units have been inspected and the data recorded, the total count of imperfections is 35.
  - (i) Calculate the control limits for the process.
  - (ii) What is the probability of Type I error for this chart?
  - (iii) Find the probability of a Type II error should the process shift to a  $\mu_c$  of 4.0. (05)
- **4A.** Explain: (i) AQL (ii) AOQ (iii) AFI
- **4B.** With a neat sketch explain the Normal curve.
- **4C.** Samples of 6 items are taken from a manufacturing process at regular intervals. A normally distributed quality characteristic is measured and  $\overline{X}$  and *s* values are calculated for each sample. After 50 subgroups have been analysed, we have

$$\sum \overline{X}$$
 = 1000 and  $\sum s$  = 75

- (i) Calculate control limits for  $\overline{X}$  and *s* control charts.
- (ii) Assume that all points on both charts fall within the control limits. What are the natural tolerance limits of the process?
- (iii) If the specification limits are  $19.0 \pm 4.0$ , what percentage of the product conforms to the specifications? (04)
- **5A.** Explain the theory of extreme runs of points with regard to control charts. (03)
- **5B.** Write a note on acceptance sampling tables. (03)
- 5C. In a system, groups of two components are connected in parallel. Three such groups are connected in series. If the reliability of each of the component is 0.9, calculate the reliability of the system.
  (04)

(03)

(03)