Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

VI SEMESTER B.TECH (INDUSTRIAL AND PRODUCTION ENGINEERING)

END SEMESTER EXAMINATIONS, JUNE 2019

SUBJECT: QUALITY CONTROL AND RELIABILITY ENGINEERING

[MME 3212]

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitably assumed.
- Use of SQC tables is permitted.

1A. Distinguish between variables and attributes. **(02)**

1B. Explain the control chart for fraction rejected and control chart for rejects. **(03)**

1C. Calculate average, standard deviation, median and mode of the frequency distribution given below:

Characteristic value (mm)	Frequency
2.0 - 3.9	3
4.0 - 5.9	7
6.0 - 7.9	12
8.0 - 9.9	19
10.0 - 11.9	26
12.0 - 13.9	38
14.0 - 15.9	52
16.0 - 17.9	35
18.0 - 19.9	23
20.0 - 21.9	14
22.0 - 23.9	7
24.0 - 25.9	4

(05)

2A. Explain the reason behind using three sigma limits on the control charts. **(02)**

2B. With a neat sketch explain the Normal curve. **(03)**

2C. Control charts for $\overline{X}$ and R, based on a subgroup size of 4, are to be used to control a process. The standard deviation of this process is 10. An aimed at value of the mean ($\overline{X}_0$) is to be 250.

(i) Determine the control limits for $\overline{X}$ and R charts.

(ii) Determine the probability of a point falling within the $\overline{X}$ chart control limits if the actual μ is 0.5σ below the aimed-at value of 250.

(iii) If the actual μ is 1.0σ below 250.

(iv) If the actual μ is 2.5σ below 250. **(05)**

3A. Explain the Tchebycheff's inequality theorem. **(02)**

3B. Explain with sketches the graphic representation methods of frequency distribution. **(03)**

3C. The following table gives the number of defects found in 25 subgroups of certain product at final inspection:

Subgroup no.	No. of defects	Subgroup no.	No. of defects
1	8	14	25
2	16	15	15
3	14	16	9
4	19	17	9
5	11	18	14
6	15	19	11
7	8	20	9
8	11	21	10
9	21	22	22
10	12	23	7
11	23	24	28
12	16	25	9
13	9		

Determine the central line and trial control limits for a c chart. What value of c_0 and control limits would you suggest for the subsequent period? **(05)**

4A. How an O.C. curve is constructed? Explain its use. **(02)**

4B. Distinguish between conventional tolerancing and statistical tolerancing. **(03)**

4C. A producer of electronic components for the automobile industry uses the following double sampling plan to inspect batches of incoming integrated circuits:

$$n_1 = 20,\ c_1 = 0,\ n_2 = 40,\ c_2 = 3$$

Use Poisson distribution table and compute the probability of acceptance. Batches contain 5% rejectable units. Assume the lot size is large in relation to the sample size. **(05)**

5A. Explain : (i) AOQL (ii) LTPD (iii) AFI **(03)**

5B. Explain Precision, Accuracy and Reproducibility with regard to method of measurements. **(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)**