

MANIPAL (A constituent unit of MAHE, Manipal)

VI SEMESTER B.TECH. (INDUSTRIAL AND PRODUCTION ENGINEERING) END SEMESTER MAKE UP EXAMINATIONS, JUNE 2018

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 permitted.
- **1A.** Distinguish between variables and attributes.
- **1B.** Explain chance causes and assignable causes of quality variation.
- **1C.** Calculate mean, standard deviation, median and mode for the following frequency distribution:

Characteristic value	24.75	24.95	25.15	25.35	25.55	25.75
Frequency	2	8	14	18	7	1

- 2A. What is the reason behind using three sigma control limits on control charts? (02)
- 2B. Explain the process capability analysis.
- **2C.** A certain process with a standard deviation of 0.001mm has been statistically controlled at a mean of 0.036 mm. The product is currently sold to a user. The user specifications are 0.038 ± 0.004 mm.
 - (i) Assuming a normal distribution of the product what percentage of product does not meet the specifications?
 - (ii) Compute C_p and C_{pk} of the process.
 - (iii) If the process centering shifts to μ of 0.037 mm, what is the probability of not detecting the shift with regard to \overline{X} chart? The subgroup size is 5.

(05)

(02)

(03)

(05)

(03)

- **3A.** Define Accuracy and Reproducibility with regard to method of measurement. **(02)**
- **3B.** Write a note on Quality costs.
- 3C. Daily inspection records are maintained on production of a special design electronic device. 100 items have been inspected each day for past 21 days. A total of 546 items failed during a particular severe heat stress test. The four highest and lowest values of *p* are:

Highest	Lowest		
0.46	0.18		
0.33	0.18		
0.31	0.20		
0.31	0.21		

- (i) Compute the central line and 3 sigma control limits for a p chart. Is the process operating in control?
- (ii) Recommend an aimed at value p_0 and 3 sigma control limits for continued use of p chart. (05)
- **4A.** Explain (i) ATI (ii) ASN (iii) AOQ
- **4B.** Write a note on measures of central tendency and dispersion. **(03)**
- 4C. A single sampling plan uses a sample size of 15 and an acceptance number of 1. The lot size is large in comparison with sample size. Use Poisson distribution table to compute the probabilities of acceptance of lots which are 2, 6, 8 and 12% defective respectively.
- 5A. Write a note on skewed frequency distribution curves. (02)5B. Explain Double and Multiple sampling plans. (04)
- **5C.** With a neat sketch explain the equipment failure pattern. (04)

(03)

(03)