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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belgaum)

Sixth Semester, B.E. - Industrial and Production Engineering

Semester End Examination; June - 2016

Quality Assurance and Reliability

Time: 3 hrs *Max. Marks: 100*

***Note**: i) Answer **FIVE** full questions, selecting **ONE** full question from each unit.*
ii) Missing data may suitably be assumed.
iii) Use of Handbook data permitted.

UNIT - I

1 a. Explain the history of quality control methodology. 10

b. Briefly discuss the importance of quality costs with relevant examples. 10

2 a. List the scope of Quality Assurance. 8

b. What is quality audit and why it is required for organizations? List and discuss the activities which are usually audited in organizations. 12

UNIT - II

3 a. What is variability and mention the reasons for variability. 10

b. Explain the six sigma concept of process capability. 10

4 a. Explain the following errors with diagram :
i) Type-I error ii) Type-II error. 10

b. Samples of n = 5 units are taken from a process every hour. The $\bar{x}$ and R values for a particular quality characteristic are determined. After 25 samples have been collected, we calculate $\bar{\bar{x}} = 20$ and $\bar{R} = 4.56$.

(i) What are the three-sigma control limits for $\bar{x}$ and R?

(ii) Both charts exhibit control. Estimate the process standard deviation. 10

(iii) Assume that the process output is normally distributed. If the specifications are 19±5, what are your conclusions regarding the process capability?

(iv) If the process mean shirt to 24, what is the probability of not detecting this shift on the first subsequent sample.

UNIT - III

5 a. Briefly discuss the situations for choosing a proper type of variable and attribute charts. 10

b. A control chart is used to control the fraction non confirming for a plastic part manufactured in an injection molding process. Ten sub groups yield the data in Table.

10

Contd….2

Sample number	Sample size	Number Non confirming
1	100	10
2	100	15
3	100	31
4	100	18
5	100	24
6	100	12
7	100	23
8	100	15
9	100	8
10	100	8

(i) Set up a control chart for the number of non confirming in samples of n = 100, (ii)for the chart established in part (i), what is the probability of detecting a shift in the process fraction non confirming to 0.30 on the first sample after the shift has occurred?

6 a. Write a note on :

i) P chart ii) C chart. 6

b. The perfect circle company manufactures once each hour a sample of 125 finished bushings is draw in from the output; each bushing is examined by a technicians those which fail are classified as defectives, the rest are satisfactory. Here are data on ten consecutive samples taken in one week.

Sample No.	1	2	3	4	5	6	7	8	9	10
Defective	15	13	16	11	13	14	20	25	30	45

14

(i) What type of control chart should be used here?

(ii) What are processes of CL, UCL, and LCL?

(iii) What Statistic should be plotted on the control chart for?

(iv) Draw the control chart on a graph.

(v) What should the quality control engineer do?

UNIT - IV

7 a. Briefly write a note on the following :

(i) OC curves (ii) Double sampling Plans. 8

b. A single sampling plan is as follows :

N = 5000; n = 100; C = 3

(i) Plot the OC curve 12

(ii) Determine the AQL and LTPD for Pr = 10%, Cr = 15 respectively.

(iii) What is the ATI the above places for 1.5% defective of the incoming lot.

Contd….3

8 a. What are Lot acceptance sampling Plans? Discuss the different kinds of Lot Acceptance Plans (LASPs). 10

b. In a double sampling plan N = 5000, n_1 = 100, n_2 = 100, C_2 = 1,

(i) Use Poisson's Table to compute the probability of acceptance of a 1% defective lot.

(ii) Assume that a lot rejected by this sampling plan will be 100% inspected. What will be the AOQ if the submitted product is 1% defective? Considering the inspection of both rejected lots, what will be the average number of articles inspected per lot if the submitted product is 1% defective. 10

UNIT - V

9 a. What is reliability and why is reliability important? Explain with neat sketch the bath tub curve. 10

b. List and explain the different types of reliability or reliability estimators. 6

c. Find the mean time to failure of a component which has a failure rate of 2 failures per year. Calculate its reliability for different mission times, e.g.10, 1000, 10000 hours. 4

10 a. What do you mean by design for reliability? Briefly discuss the methods for introducing redundancy in to a system for improving reliability. 10

b. A simple electronic circuit consist of 6 transistors each having a failure rate of 10^{-6} f/hr, 4 diodes each having a failure rate $0.5x10^{-6}$ f/hr, 3 capacitors each having a failure rate of $0.2x10^{-6}$ f/hr, 10 resistors each having a failure rate of $5x10^{-6}$ f/hr and 2 switches each having a failure rate $2x10^{-6}$ f/hr. Assuming connectors and wiring are 100% reliable, evaluate the equivalent failure rate of the system and the probability of the system surviving 1000 and 10000 hours if all components must operate for system success. 10

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