



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

(An Autonomous Institution affiliated to VTU, Belagavi)

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

Semester End Examination; July / Aug. - 2022

Quality Assurance and Reliability

Time: 3 hrs

Max. Marks: 100

Course Outcomes

The Students will be able to:

CO1: Understanding the fundamentals of quality function and concept of quality assurance.

CO2: Demonstrate the concept of statistical process control and control charts for variables.

CO3: Analyze the controls chart for fraction non-confirming (defective) development and operation of control chart.

CO4: Analyze the various sampling inspection.

CO5: Estimate the reliability and life testing.

Note: I) PART - A is compulsory. **Two** marks for each question.

II) PART - B: Answer any **Two** sub questions (from a, b, c) for a Maximum of **18 marks** from each unit.

Q. No.	Questions	Marks	BLs	COs	POs																																																																		
I : PART - A		10																																																																					
I a.	Define quality.	2	L1	CO1	PO1																																																																		
b.	What is control chart?	2	L1	CO3	PO1																																																																		
c.	Describe process capability.	2	L1	CO2	PO1																																																																		
d.	What is DSP?	2	L1	CO4	PO1																																																																		
e.	What is redundancy?	2	L1	CO5	PO1																																																																		
II : PART - B		90																																																																					
UNIT - I		18																																																																					
1 a.	What are the right dimensions of the quantity? Explain.	9	L2	CO1	PO1																																																																		
b.	Explain briefly Appraisal costs and prevention cost with examples.	9	L2	CO1	PO1																																																																		
c.	Briefly explain planning and performing audit activities.	9	L3	CO1	PO1																																																																		
UNIT - II		18																																																																					
2 a.	Explain chance and assignable causes with examples.	9	L2	CO2	PO1																																																																		
b.	With a neat sketch explain Basic principles of control chart.	9	L2	CO2	PO1																																																																		
c.	The following are \bar{X} and R values for 20 subgroups and 5 readings. The specifications for this product are 37 ± 10 ,																																																																						
	<table border="1"> <thead> <tr> <th>Sub Groups</th> <th>\bar{X}</th> <th>R</th> <th>Sub Groups</th> <th>\bar{X}</th> <th>R</th> </tr> </thead> <tbody> <tr><td>1</td><td>34.0</td><td>4</td><td>11</td><td>35.8</td><td>4</td></tr> <tr><td>2</td><td>31.6</td><td>4</td><td>12</td><td>38.4</td><td>4</td></tr> <tr><td>3</td><td>30.8</td><td>2</td><td>13</td><td>34.0</td><td>14</td></tr> <tr><td>4</td><td>33.0</td><td>3</td><td>14</td><td>35.0</td><td>4</td></tr> <tr><td>5</td><td>35.0</td><td>5</td><td>15</td><td>33.8</td><td>7</td></tr> <tr><td>6</td><td>32.2</td><td>2</td><td>16</td><td>31.6</td><td>5</td></tr> <tr><td>7</td><td>33.0</td><td>5</td><td>17</td><td>33.0</td><td>5</td></tr> <tr><td>8</td><td>32.6</td><td>13</td><td>18</td><td>28.2</td><td>3</td></tr> <tr><td>9</td><td>33.8</td><td>19</td><td>19</td><td>31.8</td><td>9</td></tr> <tr><td>10</td><td>37.8</td><td>6</td><td>20</td><td>35.6</td><td>6</td></tr> </tbody> </table>	Sub Groups	\bar{X}	R	Sub Groups	\bar{X}	R	1	34.0	4	11	35.8	4	2	31.6	4	12	38.4	4	3	30.8	2	13	34.0	14	4	33.0	3	14	35.0	4	5	35.0	5	15	33.8	7	6	32.2	2	16	31.6	5	7	33.0	5	17	33.0	5	8	32.6	13	18	28.2	3	9	33.8	19	19	31.8	9	10	37.8	6	20	35.6	6	9	L3	CO2	PO1
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Determine control limits and plot \bar{X} and R chart.

Contd... 2

UNIT - III

18

- 3 a. Explain control chart for variables and attributes.
- b. The following data refer to the production and number of defectives for 15 consecutive days. Each day 400 units were inspected.

6 L2 CO3 PO1

Days	No. of defectives	Days	No. of defectives
1	2	9	18
2	5	10	8
3	0	11	6
4	14	12	0
5	3	13	3
6	0	14	0
7	1	15	6
8	0		

12 L3 CO3 PO1

Plot 100p(np) chart and what control limits do you adopt for future production.

- c. Prepare a “C” chart based on the evidence of the cloth length given below.

100 m cloth length No.	No. of Minor defects	100 m cloth length No.	No. of Minor defects
1	2	6	0
2	3	7	2
3	1	8	1
4	4	9	4
5	4	10	2

12 L3 CO3 PO1

Is it process under control?

UNIT - IV

18

- 4 a. Explain DSP with a neat flow diagram.
- b. Write a note on;
 - i) LTPD ii) AOQ iii) ATI
- c. A DSP is as follows $N = 5000$, $n_1 = 100$, $n_2 = 100$, $C_1 = 0$, $C_2 = 1$ and $P = 0.01$. Calculate P_a , ATI and AOQ.

6 L2 CO4 PO1

12 L2 CO4 PO1

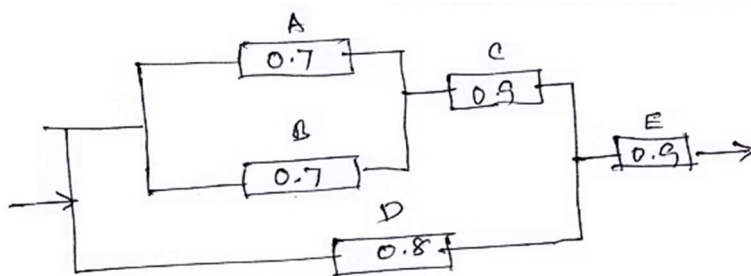
12 L2 CO4 PO1

UNIT - V

18

- 5 a. Explain the following:
 - i) Reliability ii) Failure rate iii) MTBF
- b. Calculate the reliability of the system shown below,

6 L2 CO5 PO1



12 L2 CO5 PO1

- c. Describe the various techniques of increasing reliability.

12 L2 CO5 PO1