

Name :
Roll No. :
Invigilator's Signature :

CS / B.TECH (AUE) / SEM-6 / AUE-605 / 2011
2011

QUALITY CONTROL AND RELIABILITY ENGINEERING

Time Allotted : 3 Hours

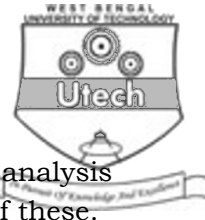
Full Marks : 70

*The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words
as far as practicable.*

Graph sheets will be supplied by the Institution.

GROUP – A
(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following : $10 \times 1 = 10$
 - i) Total quality costs include
 - a) Prevention cost
 - b) Appraisal cost
 - c) Failure cost
 - d) All of these.
 - ii) Kaizen is a technique
 - a) for gradual improvement
 - b) for continuous improvement
 - c) which does not require capital investment
 - d) all of these.
 - iii) Acceptance sampling by attribute is done by
 - a) 'Go' and 'No Go' gauge
 - b) destructive testing
 - c) actual measurement of the items
 - d) none of these.
 - iv) To reduce the cost of inspection
 - a) control charts should be followed
 - b) acceptance sampling should be used
 - c) no inspection should be carried out
 - d) none of these.



- v) Tool that helps prioritization includes
- a) Histogram
 - b) Pareto analysis
 - c) Tally chart
 - d) None of these.
- vi) Random variations in a process are due to
- a) special causes
 - b) common causes
 - c) internal causes
 - d) all of these.
- vii) Measures of dispersion include
- a) Mean
 - b) Mode
 - c) Variance
 - d) all of these.
- viii) Failure rate is equal to
- a) $\frac{1}{MTBF}$
 - b) $MTBF$
 - c) $\frac{2}{MTBF}$
 - d) none of these.
- ix) If the reading obtained by inspection are dimensions, hardness or surface roughness, should be plotted in
- a) \bar{X} chart
 - b) R chart
 - c) \bar{X} and R charts
 - d) Ordinary Graph paper.
- x) A.Q.L. stands for
- a) Acceptable Quality Level
 - b) Average Quality Level
 - c) Average Quality Limit
 - d) Acceptable Quality Limit.

GROUP - B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. Discuss the Prevention, Appraisal and Failure (PAF) model of quality cost.
3. What are the principal dimensions of quality applicable for a product ? Explain with examples.
4. What is quality circle ? What are its benefits ?
5. What is availability and outage rate ?
6. What is failure density function ? Is it a probability density function ? Explain.

**GROUP – C****(Long Answer Type Questions)**Answer any *three* of the following. $3 \times 15 = 45$

7. Small electrical assemblies are produced in lots of size 144. The table below shows the number of defective assemblies in 24 lots that were sampled, each at the end of 30 minute period, to control the process.

Lot No.	1	2	3	4	5	6	7	8	9	10	11	12
Number defective	3	2	0	1	3	4	5	2	1	3	3	0

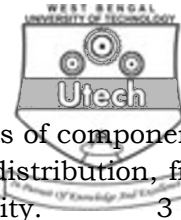
Lot No.	13	14	15	16	17	18	19	20	21	22	23	24
Number defective	8	5	0	1	2	4	2	0	6	3	1	0

Develop a p -chart and np -chart for this process. Does the process appear to be in control ? $6 + 6 + 3$

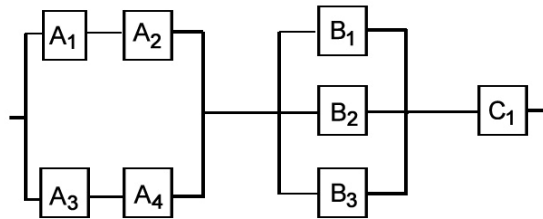
8. a) What are the various types of data ? Why is data summarization required ? What are the methods of data summarization ? $2 + 2 + 5$
- b) The following table gives quality costs in an organization. Express it in the form of PAF model and Pareto diagram.

<i>Item</i>	<i>Expenditure in dollar (\$)</i>
External audit	20,000
Field failure	40,000
In-process inspection	10,000
Product qualification	2,40,000
Scrap	45,000
Quality system	24,000
Warranty costs	50,000

 $3 + 3$



9. a) What is system reliability ? If the failures of components of a parallel system follow exponential distribution, find out an expression for the system reliability. 3 + 5
- b) Find the reliability of the eight-component system shown in figure. The reliability of the components are as follows : $R_{A1} = 0.92$, $R_{A2} = 0.90$, $R_{A3} = 0.88$, $R_{A4} = 0.96$, $R_{B1} = 0.95$, $R_{B2} = 0.90$, $R_{B3} = 0.92$ and $R_{C1} = 0.93$. 7



10. a) What is life-testing ? Give two objectives of life-testing. Explain different failure modes by bath-tub curve. 2 + 2 + 5
- b) What is Mean Time To Failure (MTTF) ? If failure rate (λ) is constant then prove that $MTTF = \frac{1}{\lambda}$. 2 + 4
11. Write short notes on any *three* of the following : 3 × 5
- Fish bone diagram
 - Kaizen concept
 - Quality system-ISO 9000 standard
 - Hazard rate
 - Redundancy.

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