

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- VIIIth SEMESTER-EXAMINATION – MAY- 2012

Subject code: 182003

Date: 14/05/2012

Subject Name: Quality Assurance & Reliability

Time: 10:30 am – 01:00 pm

Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Carry out classification of cost of quality. Give 2 examples each for each category of cost of quality. **07**
- (b) The following data refers to the production and number of defectives on visual inspection of 10 samples, each containing 200 units. **07**

Sample no.	1	2	3	4	5	6	7	8	9	10
Number of defectives	10	14	20	6	8	4	6	4	2	6

Construct a suitable control chart and comment on the process.

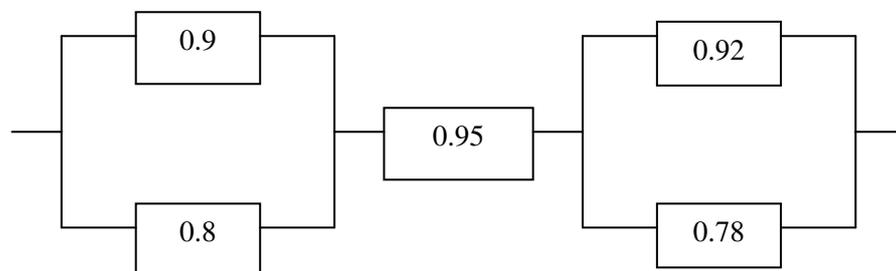
- Q.2** (a) What is redundancy? Explain various types of it. **07**
- (b) In a test involving continuous satisfactory performance of 120 electronic instruments under excessive vibration conditions, the following failure frequencies were observed, the total test period being 7 hours: **07**

Time interval (hour)	Number of failures	Time interval (hour)	Number of failures
0-1	3	4-5	15
1-2	17	5-6	10
2-3	27	6-7	5
3-4	43		

Tabulate the values of failure rate, failure density, reliability and probability of failure.

OR

- (b) Calculate the reliability of the system. **07**



- Q.3** (a) 1. Explain the Kolmogorov's Axioms. **03**
2. Define: Reliability, random event, certain event, MTTF **04**

- (b) Three V-belts are used for driving a machine tool. However for satisfactory working of machine at least two belts should work satisfactorily. If the probability of failure of each of the three belts is 0.08, find the probability of satisfactory performance of the machine. **07**

OR

- Q.3** (a) A machine tool manufacturing concern buys its requirements of coolant pumps from four ancillary units A, B, C and D. On the average, the requirements of the company are met in the following proportion: **07**

A= 40% , B= 20%, C= 25%, D= 15%

Because of the variations in the production process employed by the ancillary units, the reliability characteristics of their product are as follows:

R(A) = 85%, R(B) = 73%, R(C) = 82%, R(D) = 90%

If a coolant pump is found to work satisfactorily for the stipulated time, what is the probability that the pump was supplied by firm D?

- (b) Explain the linearly increasing hazard model in detail. **07**

- Q.4** (a) Explain key elements of TQM. **07**

- (b) Piston rings for a motor cycle engine produced by a forging process. The specification limits on the piston rings are 74.000 ± 0.05 mm. Establish statistical control of inside diameter of the ring manufactured by the process using \bar{X} and R values of 25 samples and comment on the process. **07**

Sample No	\bar{X}	R	Sample No.	\bar{X}	R
1	74.010	0.038	14	73.991	0.040
2	74.001	0.018	15	74.006	0.016
3	74.008	0.037	16	73.997	0.020
4	74.003	0.021	17	74.001	0.027
5	74.003	0.027	18	74.007	0.018
6	74.995	0.023	19	73.997	0.021
7	74.000	0.013	20	74.010	0.020
8	73.998	0.031	21	74.000	0.032
9	74.004	0.013	22	74.002	0.020
10	73.998	0.017	23	74.002	0.025
11	73.994	0.008	24	74.004	0.022
12	74.001	0.011	25	73.999	0.035
13	73.997	0.028			

Assume $A2 = 0.577$, $D4 = 2.114$, $D3 = 0$ and $d2 = 2.326$

OR

- Q.4** (a) Construct a fishbone diagram for long queue at railway reservation windows. **07**

- (b) Explain following: **07**

1. Corrective actions & preventive actions in the context of Non conformity report
2. Control of customer supplied products

- Q.5 (a)** Following data is collected for the no. of complaints received from customers by an air-conditioner dealer. **07**

Complaint Code	Type of complaint	Frequency of occurrence
A	Noisy operation	05
B	Swing operation not working	42
C	Faulty power supply	08
D	Remote control malfunctioning	58
E	Compressor malfunctioning	03
F	Gas leakage	02
G	Poor cooling	04
H	Dripping of water	06

Draw Pareto diagram and comment suitably.

- (b)** What do you understand by: **07**
1. Taguchi's loss function
 2. DMAIC approach of Six sigma

OR

- Q.5 (a)** Explain the procedure of acquiring ISO9001 certification with different types of audits involved in the process. **07**

- (b)** Evaluate following statements. **07**
1. If all the internal customers are satisfied, external customer is bound to be satisfied.
 2. Quality of design depends on quality of conformance and quality of performance.
