Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME Semester –II Examination Dec. - 2011

Subject code: 1720909 **Date: 19/12/2011**

Subject Name: Quality Control and Reliability

Time: 02.30 pm – 05.00 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) What is cost of quality? Which are the costs included in cost of quality? Explain any two types of cost of quality. **07**

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

Sample No	$\overline{X}$	R	Sample No.	$\overline{X}$	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

Q.2 (a) In a manufacturing process, the numbers of defectives found in the inspection of 15 lots of 400 items each are given below. **07**

Lot No.	No. of defectives	Lot No.	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		

- Determine the trial control limit for np chart and state whether the process is in control.
- What will be new value of mean fraction defective if some obvious points outside control limits are eliminated? What will be the corresponding upper and lower control limits and examine whether the process is still in control or not.

(b) 'Quality circle can lead towards overall improvement in the quality of products, process and motivation through participation for the employees.' –Justify. **07**

OR

(b) Evaluate the following statements: **07**

1. Quality of conformance depends upon quality of design and quality of performance.
2. TQM can succeed only if it has the support of Total Quality People.

Q.3 **(a)** Briefly state and describe Deming's 14 points for quality management. **07**

(b) Explain TQM operations. **07**

OR

Q.3 **(a)** What is 'Quality Audit'? Name and describe the various types of quality audits. **07**

(b) Explain the mentioned clauses of ISO:9001 model **07**

1. Control of Non-Conforming products
2. Design Control

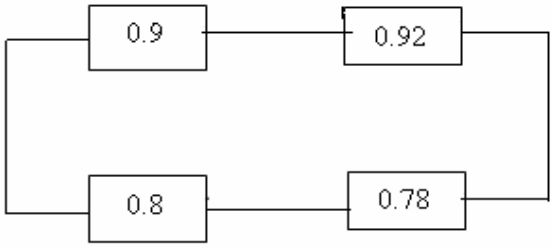
Q.4 **(a)** Construct the fishbone diagram for malfunction of a robotic arm controlled by a microcontroller. **07**

(b) What is Muda? Explain various types of Mudas. **07**

OR

Q.4 **(a)** Explain the Taguchi's principal in context of "Larger the better", "Smaller the better" and "Nominal the best"" with suitable examples. **07**

(b) Calculate reliability of the system using fault tree analysis. Here each block is representing reliability of individually. **07**



Q.5 **(a)** Explain the following terms in context of OC curve: Consumer's risk, producer's risk, AQL, LTPD, AOQ L, AOQ and RQL. **07**

(b) In a test involving continuous satisfactory performance of 120 electronic microchips under excessive vibration conditions, the following failure frequencies were observed, the total test period being 7 hours. Find failure density, failure rate, reliability and probability of failure in tabulate format. **07**

Time interval(hrs)	0-1	1-2	2-3	3-4	4-5	5-6	6-7
No. of failures	10	20	30	22	20	10	08

OR

Q.5 **(a)** Explain the following terms: **07**

1. Jidoka and Pull System
2. Cusum Chart and V - Mask

(b) Explain the following terms: **07**

1. Semi Markov system
2. Reliability and maintainability

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