Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Sem-II Remedial Examination December 2010

Subject code: 720909

Subject Name: Quality Control and Reliability

Date: 23/12 /2010 **Time: 02.30 pm – 05.00 pm**

Total Marks: 60

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Notations carry usual meanings.**

Q.1 (a) A process produces M.S. washers in lot of size 2500. Inspection records on 20 lots reveal the following data: **06**

Lot No.	No. of defective	Lot No.	No. of defective
1	231	11	458
2	434	12	394
3	220	13	286
4	347	14	330
5	231	15	199
6	328	16	415
7	285	17	132
8	312	18	270
9	341	19	220
10	309	20	407

From the above given data

1) Compute control limits for np chart
2) Determine the control limits for p chart
3) Comments on the result obtained

(b) Draw a Pareto diagram for the following data of complaints received by the service department of a company manufacturing and supplying Pressure vessels. Also give your comments. **06**

Type of complaint	Frequency	Type of complaint	Frequency
Wrong location of foundation supports	4	Malfunctioning of speed variator	14
Misalignment of nozzles	7	Misalignment between driver and driven shaft	2
Wrong supply	4	Faulty Pressure gauge	66
Working/instruction manual not supplied	11	Faulty Temperature gauge	4
Leakage from the joints	94	Noisy Gear box	3

Q.2 **(a)** Control charts for $\overline{X}$ and R are maintained on certain dimensions of a manufactured part, measured in mm. The subgroup size is 4. The values of $\overline{X}$ and R are computed for each subgroup. After 20 subgroups $\sum\overline{X}$ =412.83 and $\sum$R= 3.39. Compute the values of 3 sigma limits for the $\overline{X}$ and R charts and estimate the value of σ' on the assumption that the process is in statistical control. (For sub group of 4 items d_2= 2.059, D4 = 2.28, D3 = 0) **06**

(b) A single sampling plan uses a sample size of 15, and an acceptance number is 1. Using hyper geometric probabilities, compute the probability of acceptance of lots of 50 articles 2% defective. **06**

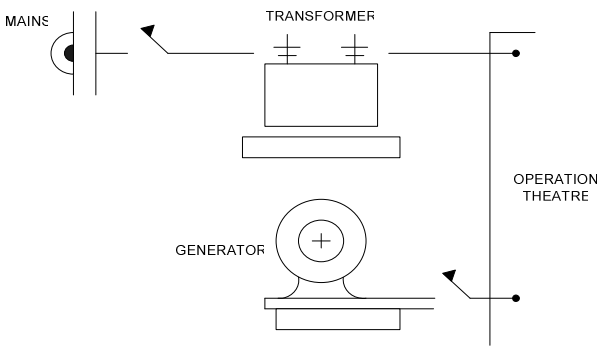
OR

(b) In an injection moulding process the die wears out gradually. To account for this wear it is suggested that, control charts to be constructed for the outside diameter of the components produced. The following table shows the averages and ranges of the outside diameters in millimeters for 20 subgroups of 5 items each. Plot the $\overline{X}$ and R chart and give your comments about the process. **06**

Sample No	$\overline{X}$	R	Sample No.	$\overline{X}$	R
1	107.6	3.1	11	111.6	2.3
2	104.3	2.6	12	113.3	2.5
3	103.5	2.8	13	109.8	2.4
4	105.7	2.4	14	110.5	2.1
5	104.8	3.2	15	108.6	2.6
6	108.5	2.5	16	112.7	1.8
7	109.7	2.8	17	114.2	2.8
8	105.3	1.7	18	115.5	3.0
9	112.6	2.4	19	112.8	2.7
10	110.5	2.0	20	116.2	2.2

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

Q.3 **(a)** For an emergency operation theatre in a hospital, the power is obtained from the main city supply through a transformer connected in series. To ensure an uninterrupted supply, an auxiliary generator is also used with a suitable switch-over. The probability of failure of the city supply is 0.01 and the transformer reliability is 0.996. The auxiliary power generator has a reliability factor of 0.99. Draw the block diagram for the system. Construct fault tree and based on this calculate reliability of the system. **06**



(b) Construct the cause and effect diagram for malfunction of an electric generator. **06**

OR

Q.3 **(a)** Explain the following terms: **06**

1. impossible and certain events
2. Maintainability
3. Achieved Availability

(b) 'Quality circle can lead towards overall improvement in the quality of products, process and motivation through participation for the employees.' – Justify. **06**

Q.4 **(a)** Explain the various elements required to implement TQM (Total Quality Management). **06**

(b) Explain the Taguchi's principal. Show with relevant example that it leads to the robust design. **06**

OR

Q.4 **(a)** Explain the mentioned clauses of ISO:9001 model **06**

1. Non-Conformity Report (NCR)
2. Compliance audit
3. Contract review

(b) Explain the following terms: **06**

1. Six Sigma
2. 5S concept
3. Cluster sampling

Q.5 **(a)** Explain the Juran's steps for quality improvement. **06**

(b) Explain the basic concept of kaizen. Explain how one can pursue kaizen in any system. **06**

OR

Q.5 **(a)** Assuming that the life in hours of an electric bulb is a random variable following normal distribution with mean of 2000 hours and standard deviation of 400 hours. Find the expected number of bulbs from a random sample of 5000 bulbs having life **06**

(a) Less than 800 hours
(b) Between 2300 and 2800 hours

Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
-3	.0013	.0013	.0013	.0012	.0012	.0011	.0011	.0011	.0010	.0010
-2.9	.0019	.0018	.0018	.0017	.0016	.0016	.0015	.0015	.0014	.0014
0.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
0.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857

(b) Explain the following terms: **06**

1. Cost of Internal Failure
2. Cost of External Failure
3. Quality of Design

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