

GUJARAT TECHNOLOGICAL UNIVERSITY**M. E. - SEMESTER – II • EXAMINATION – SUMMER • 2013****Subject code: 1724603****Date: 03-06-2013****Subject Name: Quality Engineering and Six Sigma Fundamentals****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) Define quality with respect to following dimensions. **07**
 (i) Performance (ii) Durability (iii) Conformance (iv) Serviceability
 (v) Reliability (vi) Features (vii) Safety
- (b) Discuss the contribution of Taguchi in designing off-line quality control techniques with the help of quality loss function. **07**
- Q.2** (a) Compare Deming's PDCA cycle with Juran's Quality Trilogy. **07**
 (b) Trace the journey of Quality through Inspection-to-Control-to-Assurance-to-Management explaining changing perspective of quality at each level. **07**

OR

- (b) Explain how 5S technique will help improve quality and productivity of any business. What are the limitations of 5S techniques? **07**
- Q.3** (a) The following table shows data obtained over a 10 days period to initiate X-bar and R charts for a quality characteristic of a product that had required a substantial amount of rework. All the figures apply to product made on a single machine by a same operator. (Take $A_2 = 0.58$, $D_4 = 2.11$, $D_3 = 0$, $d_2 = 2.326$) **07**

Sample No.	X-bar	R	Sample No.	X-bar	R
1	177.6	23	11	179.8	9
2	176.6	8	12	176.4	8
3	178.4	22	13	178.4	7
4	176.6	12	14	178.2	4
5	177.0	7	15	180.6	6
6	179.4	8	16	179.6	6
7	178.6	15	17	177.8	10
8	179.6	6	18	178.4	9
9	178.8	7	19	181.6	7
10	178.2	12	20	177.6	10

- a) Calculate control limits of X-bar and R charts and if required recalculate the same till all the observations are under control. (Do not draw the charts. Decide based on data available in above table only.)
- b) The specification of the product in question is 171 ± 11 . If a product falls below the lower specification limits it must be scrapped, whereas if it falls above the upper specification limit it may be reworked. As scrapping the product is much more costly than rework, it is advisable to shift the process mean such that none of the product needs scrapping, however, reworking can be allowed. Suggest the new target process mean for this condition.
- (b) List 7 New Quality Management Tools and explain any one with suitable example. **07**

OR

- Q.3 (a)** The following table indicates the number of defects found in a bunch of 25 products inspected. **07**

Product No.	Number of Defects	Product No.	Number of Defects	Product No.	Number of Defects
1	8	10	12	19	11
2	16	11	23	20	9
3	14	12	16	21	10
4	19	13	9	22	22
5	11	14	25	23	7
6	15	15	15	24	28
7	8	16	9	25	9
8	11	17	9		
9	21	18	14		

Decide on suitable control chart and draw the same and conclude based on the same. If required, based on your conclusion, calculate new control limits for the future.

- (b)** Following details are collected from the monthly QC report of M/s. XYZ Ltd. a steel foundry. The report pertains to the casting defects observed in one of the critical products. The company wants to concentrate on few critical defects only and does not want to waste their resources on detailed investigation of all the defects reported. Draw Pareto Chart based on this data taking suitable scale in your answer sheet only and conclude accordingly. **07**

Sr. No.	Defect	Quantity of defect observed / Month
1	Blow holes	70
2	Pin holes	50
3	Cracks	15
4	Poor surface	5
5	Contraction	5
6	Porosity	55

- Q.4 (a)** "Cost of Quality System is a double-edged sword: it improves quality and reduces cost." Justify the statement with suitable example. **07**
- (b)** What is Concurrent Engineering? Explain the role of QFD and FMEA in concurrent engineering. **07**

OR

- Q.4 (a)** Explain the characteristics of quality in service sectors. **07**
- (b)** Explain the relevance of ISO:9000, ISO:14000 and QS:9000 in overall business improvement. **07**

- Q.5 (a)** Explain DMAIC methodology of Six Sigma. **07**
- (b)** Explain the significance of DPMO, C_p and C_{pk} calculations in Six Sigma. **07**

OR

- Q.5 (a)** Describe a typical Six Sigma project organization structure explaining the roles each level of team members have to play. **07**
- (b)** List and explain important issues to be taken care of while implementing Six Sigma methodology. **07**
