

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – II • EXAMINATION – SUMMER • 2014

Subject code: 1724603

Date: 20-06-2014

Subject Name: Quality Engineering and Six Sigma Fundamentals

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) Explain the changing perspective of Quality from mere one of the characteristics of a product to overall business winning strategy giving suitable examples. **07**
- (b) Explain the similarities in Deming's PDCA cycle and DMAIC methodology of Six Sigma. **07**

- Q.2** (a) Classify 7 QC tools in to following three categories giving appropriate justification. **07**
- i) Data Collection
ii) Data Presentation
iii) Data Analysis

- (b) Discuss the contribution of Dr. Taguchi in the field of quality engineering. **07**

OR

- (b) Explain the prerequisites, advantages and limitations of Quality Circle. **07**
- Q.3** (a) Following table illustrates diameter of a shaft turned on a lathe machine. A sample of six shafts was taken each day for eight days in series to draw this table. The shaft diameter is 23.75 +/- 0.1 mm. Construct X-bar and Range Charts from the data available. Calculate process capability of the machine and comment suitable based on your calculations. (Draw charts on your answer sheet only taking suitable scale). **07**

1 st Day	2 nd Day	3 rd Day	4 th Day	5 th Day	6 th Day	7 th Day	8 th Day
23.77	23.80	23.77	23.79	23.75	23.78	23.76	23.76
23.80	23.78	23.78	23.76	23.78	23.76	23.78	23.79
23.78	23.76	23.77	23.79	23.78	23.73	23.75	23.77
23.73	23.70	23.77	23.74	23.77	23.76	23.76	23.72
23.76	23.81	23.80	23.82	23.76	23.74	23.81	23.78
23.75	23.77	23.74	23.76	23.79	23.78	23.80	23.78

(Take $A_2 = 0.48$, $D_4 = 2$, $D_3 = 0$, $d_2 = 2.534$)

- (b) What is there at abscissa and ordinate of an Operating Characteristic curve? What is the use of OC curve? Define Producers' Risk and Consumers' Risk. Draw an ideal OC curve and typical OC curve and indicate Producers' Risk and Consumers' Risk on the same. **07**

OR

- Q.3 (a)** Following table indicates the defects observed in a product during a month long inspection in a company. The owner of 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 Code	Quantity of defect observed per month
1	A	70
2	B	50
3	C	10
4	D	05
5	E	05
6	F	55
7	G	05

- (b)** The following table indicates the number of defects observed in a batch of 20 Valve Body Casting. **07**

Valve Body Casting No.	Number of Defects	Valve Body Casting No.	Number of Defects
1	2	11	3
2	2	12	0
3	4	13	5
4	7	14	4
5	5	15	3
6	6	16	10
7	7	17	4
8	14	18	3
9	2	19	12
10	9	20	6

Decide on suitable control chart, draw the same and conclude based on the same. (Draw chart on your answer sheet only taking suitable scale). If required, based on your conclusion, calculate new control limits for the future. Do not draw control chart in this case.

- Q.4 (a)** XYZ Ltd. is a steel foundry. A snapshot of their last month expenditure is as below..... **07**

Sr.	Expenditure Particulars	Rs.
1	Travelling expenses of QC engineer deputed on site of one the customers to fix the problem of defective castings.	10,000
2	Purchase of Ultrasonic Inspection Test setup to check the quality of castings produced	1,50,000
3	Transportation charges paid for defective castings returned back from the customers.	15,000
4	Training cost of two QC engineers for Six Sigma Green Belt	30,000
5	Scrapping of castings found defectives and beyond repair after in house heat –treatment process.	5000
6	Repairing of few defective castings at their fettling shop.	3000
7	Monthly charges paid to ISO 9000 quality consultant.	45,000

Bifurcate above expenses in four categories of COQ, that is, Prevention Cost, Appraisal Cost, Internal Failure Cost and External Failure Cost.

- (b)** List 7 new quality management tools. Select appropriate tool out of 7 new quality management tools for following cases. (Only one per case). **07**
- i) Deciding the priority for application of probable solutions found out for an issue on hand.
 - ii) Manufacturing a product for which you don't have any past experience/data.
 - iii) Arranging jumbled ideas/solutions in to logical groups.
 - iv) Generating probable solutions in to hierarchical manner for a problem on hand
 - v) Drawing interrelationships among multiple probable solutions/issues identified for a problem on hand.
 - vi) Arranging correlation of two factors with some numeric value in a tabular format.

OR

- Q.4 (a)** Draw a typical house of quality structure and explain significance of each part. **07**
- (b)** Differentiate between manufacturing and service sectors in terms of identifying, controlling and improving quality characteristics giving suitable examples. **07**

- Q.5 (a)** Differentiate between DMAIC and DMADV methodology of Six Sigma improvement drive. **07**
- (b)** Explain in general the critical success factors of Six Sigma implementation. **07**

OR

- Q.5 (a)** Describe the basic objectives of and typical tools and techniques used at each phase of DMAIC methodology of Six Sigma. **07**
- (b)** Explain what are the typical roles and responsibilities of a Black Belt in a typical Six Sigma project. **07**
