Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/M.Tech(IEM)/SEM-2/IEM-202/2011

2011

QUALITY ENGINEERING & MANAGEMENT

Time Allotted : 3 Hours *Full Marks* : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Answer any *five* questions. 5 × 14 = 70

1. a) What are meant by Six Sigma and value enrichment ? Do you agree that value can truly be enriched through the practice of Six Sigma ? 7

   b) Six Sigma methodology needs the use of DMAIC. Elaborately discuss DMAIC and explain each of the elements. 7

2. a) Illustrate 'Quality Function Deployment' Model using an example. 7

   b) Elucidate FMEA and its usefulness in industry. 7

3. a) Explain the terms 'Treatment condition', 'Design Matrix' and 'Degree of Freedom'. 9

   b) Determine minimum number of 'Treatment conditions' reguired for the following experiment : 5

   5 Factors *A, B, C, D, E*

   2 Interactions *AE, BC* and *CD*

   2 Levels of each factor.

4. a) What are the benefits of ISO registration ? Describe the ISO 9000 family of standards. Also discuss how over the years standards have been modified. 11

   b) Briefly discuss incoming, inprocess and outgoing inspection methods in a manufacturing unit. 3

5. a) From the following data recorded during production inspection of an item determine,

   i) Mean

   ii) UCL

   iii) LCL

iv) Plot the graph in $\bar{X}$ and R charts showing whether the process is under control or not.

Sl. No. of Observations	***Individual Measurements***		
	I	***II***	***III***
1	15·35	15·40	15·75
2	15·25	15·50	15·60
3	15·45	15·35	15·38
4	15·41	15·42	15·74
5	15·38	15·26	15·70
6	15·26	15·61	15·73
7	15·32	15·60	15·50
8	15·30	15·54	15·55
9	15·31	15·28	15·47
10	15·71	15·39	15·36

The values of factors A_2, D_3 and D_4 for three items observation per draw are 1·023, 0 and 2·575 respectively. 11

b) What is the difference between 'Attribute' and 'Variable' with respect to quality control charts. 3

6. Following table compiles the data of a chemical process for reaching your conclusion :

Level	***Factor :***	***Temp.***	***Catalyst Grade***	***Reaction Time***
1		75 cal	4	50 secs
2		90 cal	6	40 secs

Orthogonal Array is given below :

Treatment	***Melt Temp.***	***Melt Flow***	***Pressing Time***	***Respouse***
1	1	1	1	16
2	2	1	1	18
3	1	2	1	24
4	2	2	1	26
5	1	1	2	20
6	2	1	2	20
7	1	2	2	22
8	2	2	2	30

7 a) Twenty samples of size 100 units each were collected in a high pressure valve manufacturing unit over a period of ten days. The number of defective components found in the samples are presented below :

6, 7, 4, 9, 5, 4, 6, 10, 3, 4
1, 4, 0, 8, 11, 5, 9, 2, 1, 7

Prepare the stable fraction defective p-control chart from the abode data. 8

b) What type of control chart should be used for multiple types of defects in each unit of a product in a foundry ? Elucidate the method of determining the mean and control limits in this respect. 6

8. Write short notes on any *two* of the following : 7 + 7

a) Affinity diagram and interrelationship diagram

b) Acceptance sampling and OC curve

c) Quality circle

d) Kaizen in TQM

e) Cost of Quality

f) Process capability and zero defect.