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GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – I • EXAMINATION – WINTER • 2014

Subject code: 710906N **Date: 05-12-2014**

Subject Name: Robust Design

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 mark.**

Q-1 (a) Citing suitable example explain the terms ñRandomization and blockingò inthe context of design of experiments **07**

(b) ñThough either a two level full factorial or a two level half fractional factorial design can be used as a screening experiment fractional factorial design is preferred.ò Evaluate this statement. **07**
Explain, with the help of a suitable example, why central points are added to a 2^k experimental design?

Q-2 (a) With the help of a suitable example explain the following terms : **07**
(a) Main effects (b) interaction

(b) With the help of a suitable example explain the following terms : **07**
(a) Characterizing a process (b) Optimizing a process

OR

(b) Write down the one half fraction of the 2^3 factorial design taking ABC as thegenerator. What you mean by aliases? Write down all the aliases of the 2^{3-1}fractional design. **07**

Q-3 (a) An article in Solid State Technology describes the application of factorial designs in developing a nitride etch process on a single wafer plasma etcher . The process uses C_2F_6 as the reactant gas. It is possible to vary the gas flow, the power applied to the cathode, the pressure in the reactor chamber, and the spacing between the anode and the cathode (gap). Response is etch rate in (A^0/min).There is an original unreplicated 2^4design to which 4 center points have been added. Average of reponses at four centre points is752.75 and average of 16 factorial points is 776.0625. Mention the DOE table and estimate the curvature sum of squares. **07**

(b) With the help of a suitable example explain the term ñTaguchi Lossfunctionò. How significant is this concept in the context of ensuring quality of the product **07**

OR

Q-3 (a) What is loss function? With the help of suitable examples explain the following loss functions with regards to Taguchi philosophy: **07**
(i)Nominal is the best (ii) lower is better (iii) higher is better

(b) What is signal-to-noise ratio? Explain the terms (i) inner array (ii) outer array (iii) crossed array design. **07**

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Q-4	**(a)**	Explain the following terms citing suitable examples: (i) full factorial design (ii) one-half factorial design	**07**
	(b)	Explain the meaning and significance of each entity of ANOVA table.	**07**
		OR	
Q-4	**(a)**	Explain the procedure to be adopted, in detail, to identify the optimal region for a response surface model	**07**
	(b)	Explain Blocking and Confounding in 2^k design	**07**
Q-5	**(a)**	Explain the response surface approach to robust design	**07**
	(b)	What is six sigma approach? Explain about six sigma project teams	**07**
		OR	
Q-5	**(a)**	Explain simple linear regression model. Explain how can one estimate regression parameters for this model?	**07**
	(b)	Explain about the principles of six sigma implementation	**07**

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