

University of Mumbai
Examination 2020 under cluster

Program: Engineering

Curriculum Scheme: Revised 2016

Examination: Final Year

Semester VII

Course Code: **ILO7014**

Course Name: **Design of Experiments**

Time: 1 hour

Max. Marks: 50

Note to the students:- All the Questions are compulsory and carry equal marks .

Q1.	A procedure for moving sequentially in the direction of maximum decrease in the response is called _____ and used for _____ .
Option A:	Method of steepest ascent, maximization
Option B:	Method of steepest ascent, minimization
Option C:	Method of steepest descent, minimization
Option D:	Method of steepest descent, maximization
Q2.	Consider the mathematical model $y = f(x, z);$ $\Delta y = \frac{\partial f}{\partial x} \Delta x + \frac{\partial f}{\partial z} \Delta z$ Now determining the x variability so that the effects of the uncontrollable variables are minimized is called ____.
Option A:	Process optimization
Option B:	Robust design
Option C:	Process control
Option D:	Process characterization
Q3.	The objective of Response surface methodology is to _____
Option A:	Maximize the response
Option B:	Minimize the response
Option C:	Optimize the response
Option D:	Neglect the response
Q4.	The method of steepest ascent is a procedure for moving sequentially in the.
Option A:	direction of the average increase in the response
Option B:	direction of the minimum increase in the response
Option C:	direction of the maximum increase in the response
Option D:	Direction perpendicular to the maximum increase in the response

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Q5.	Consider the equation used for estimation of parameters in Linear regression models $\mathbf{y} = \mathbf{X}\boldsymbol{\beta} + \boldsymbol{\epsilon}$. In this equation the size of the matrix X is ____.
Option A:	$n \times p$
Option B:	$P \times n$
Option C:	$k \times p$
Option D:	$p \times k$
Q6.	Consider the equation used for estimation of parameters in Linear regression models $\mathbf{y} = \mathbf{X}\boldsymbol{\beta} + \boldsymbol{\epsilon}$. In this method equation for evaluation of $\hat{\boldsymbol{\beta}}$ is ____.
Option A:	$\hat{\boldsymbol{\beta}} = (\mathbf{X}'\mathbf{X})^{-1}\mathbf{X}'\mathbf{y}$
Option B:	$\hat{\boldsymbol{\beta}} = \mathbf{I} - (\mathbf{X}'\mathbf{X})^{-1}\mathbf{X}'\mathbf{y}$
Option C:	$\hat{\boldsymbol{\beta}} = -(\mathbf{X}'\mathbf{X})^{-1}\mathbf{X}'\mathbf{y}$
Option D:	$\hat{\boldsymbol{\beta}} = (\mathbf{X}'\mathbf{X})^{-1}\mathbf{X}'\mathbf{y} - \mathbf{I}$
Q7.	The test for significance of regression is attest to determine whether a linear relationship exists between the response variable y and a subset of the regressor variables x_1, x_2, \dots, x_k . The appropriate hypothesis are ____.
Option A:	$H_0 : \beta_1 = \beta_2 = \dots = \beta_k = 0$ $H_1 : \beta_j \neq 0$ for at least one j.
Option B:	$H_0 : \beta_1 = \beta_2 = \dots = \beta_k = 1$ $H_1 : \beta_j = 0$ for at least one j.
Option C:	$H_0 : \beta_1 = \beta_2 = \dots = \beta_k = -1$ $H_1 : \beta_j = 0$ for at least one j.
Option D:	$H_0 : \beta_1 = \beta_2 = \dots = \beta_k = 1$ $H_1 : \beta_j \neq 1$ for at least one j.
Q8.	In the two one-half fractions 2^k design the two factor interactions are given by ____.
Option A:	[BC] = 0.5 (a + b - c + abc) [AC] = 0.5 (-a + b - c + abc) [AB] = 0.5 (-a + b + c + abc)
Option B:	[BC] = 0.5 (a - b - c + abc) [AC] = 0.5 (-a + b - c + abc) [AB] = 0.5 (-a - b + c + abc)
Option C:	[BC] = 0.5 (a - b - c - abc) [AC] = 0.5 (-a + b - c - abc) [AB] = 0.5 (-a - b + c - abc)
Option D:	[BC] = 0.5 (-a + b - c - abc) [AC] = 0.5 (-a + b - c - abc) [AB] = 0.5 (-a + b + c - abc)

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Q9.	What is the appropriate statistical test for a factorial design?
Option A:	the Modes test
Option B:	ANOVA
Option C:	t-test
Option D:	chi-square
Q10.	Each main plot is divided into subplots depending on the number of _____.
Option A:	Sub plot treatments
Option B:	Pre plot treatments
Option C:	Post plot treatments
Option D:	Modified plot treatments
Q11.	In field experiments certain factors may require _____ plots than for others.
Option A:	Lesser
Option B:	Same
Option C:	Larger
Option D:	Small
Q12.	Which of the following statements is correct about interactions?
Option A:	They are enhancements of the effect.
Option B:	They are additive effects.
Option C:	They are spurious effects.
Option D:	They occur only in interaction with organismic dependent variables.
Q13.	Factorial designs _____.
Option A:	include no more than one research hypothesis.
Option B:	cannot test participants across more than one condition.
Option C:	contain more than one null hypothesis.
Option D:	are ineffective when matched participants are included.
Q14.	For a 2^{k-1} design with defining relation I=ABC, the experimenter wants to consider main effects and two-factor interaction effects; the alias matrix will be
Option A:	$\begin{bmatrix} 0 & 0 & 0 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$

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Option B:	$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$
Option C:	$\begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 1 \end{bmatrix}$
Option D:	$\begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$
Q15.	The design in which no main effect is aliased with any other main effect, or with any two-factor interaction, but two-factor interactions are aliased with each other are called _____.
Option A:	Resolution VI design
Option B:	Resolution V design
Option C:	Resolution IV design
Option D:	Resolution III design
Q16.	What must we include when reporting an ANOVA?
Option A:	Standard deviation, degrees of freedom, Margin
Option B:	Degrees of freedom, Standard deviation, Means
Option C:	Means, Standard deviation, Margin
Option D:	Margin, degrees of freedom, Means
Q17.	Designs in which more than one variable are studied simultaneously are called _____ designs.
Option A:	factorial
Option B:	sum of squares
Option C:	two tailed
Option D:	replicate
Q18.	What will be the correct sequence of DOE to understand the process settings ?
Option A:	Interpret result-Perform Experiments-Prediction model-optimize the function
Option B:	Perform experiments-Interpret Result-Prediction model-optimize the function
Option C:	Perform experiments-Interpret result- optimize the function- Prediction model
Option D:	Perform experiments-Prediction Model-Interpret result- optimize the function
Q19.	Which of the following typically generate negative information about which factors do not make a difference in the quality characteristic of interest?
Option A:	sample data sets
Option B:	attribute data sets
Option C:	bad data sets
Option D:	good data sets

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Q20.	A continuous form of data is called as-
Option A:	attribute data
Option B:	variable data
Option C:	discontinuous data
Option D:	sample data
Q21.	Which of the following is a statistical consideration in conducting experiments?
Option A:	statistically valid sample size should be used
Option B:	parts should be tagged during tests
Option C:	variable data should be used
Option D:	attribute data should be used
Q22.	Which of the following is an example of Taguchi's three level design?
Option A:	L4
Option B:	L8
Option C:	L12
Option D:	L27
Q23.	The main difference between traditional Design of Experiments and Taguchi's Design of Experiments is -
Option A:	Taguchi's DoE considers average to be more interesting to study than the variation
Option B:	Taguchi's DoE considers statistics to study variation
Option C:	Taguchi's DoE considers attribute data to study variation
Option D:	Taguchi's DoE considers variation to be more interesting to study than the average
Q24.	Which of the following S/N ratio you will choose for defects?
Option A:	smaller the better
Option B:	larger the better
Option C:	nominal the best
Option D:	optimum the better
Q25.	A factor with a range of settings, that is controlled by the user during use is called as -
Option A:	random factor
Option B:	robust factor
Option C:	nominal factor
Option D:	signal factor

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Question	Correct Option (Enter either 'A' or 'B' or 'C' or 'D')
Q1.	C
Q2.	B
Q3.	C
Q4	C
Q5	A
Q6	A
Q7	A
Q8.	B
Q9.	B
Q10.	A
Q11.	C
Q12.	A
Q13.	C
Q14.	D
Q15.	C

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Q16.	B
Q17.	A
Q18.	B
Q19.	C
Q20.	B
Q21.	A
Q22.	D
Q23.	D
Q24.	A
Q25.	D