(DMSTT21)

Assignment-1
M.Sc. DEGREE EXAMINATION, MARCH – 2023
Second Year
STATISTICS
Statistical Quality Control
MAXIMUM MARKS: 30
Answer ALL Questions

Q1) a) Explain statistical basis of control charts. Explain the interpretation of $\overline{X}$ - chart.

b) Explain the construction of $\overline{X}$ - chart. Obtain OC and ARL for $\overline{X}$ Chart.

Q2) a) Explain the construction of Medium Chart and standard deviation control chart. Describe the patterns on $\overline{X}$ and range control charts.

b) Explain the OC and ARL curves for $\overline{X}$ - chart. Explain their use.

Q3) a) Explain the development and operation of control chart for number of defectives. How would you measure the sensitivity of the control chart?

b) Explain natural limits and specification limits. Explain their interpretation.

Q4) a) Explain the construction and operation of control chart for number of defects per unit. Give any four applications of it.

b) Under what conditions in industry would you consider it economical to use the p-chart and the c-chart? Does a process in statistical control, ensure that all the product will be within specifications? Justify by means of an example.

Q5) a) Explain the moving average control chart and its OC curve.

b) Explain Hotelling's T^2 Control Chart.

(DMSTT21)

Assignment-2
M.Sc. DEGREE EXAMINATION, MARCH – 2023
Second Year
STATISTICS
Statistical Quality Control
MAXIMUM MARKS: 30
Answer ALL Questions

Q1) a) What is V-mask? How do you use it for process control?

b) Discuss the ANOM for $\overline{X}$ - chart and p-Chart.

Q2) a) Define simple sampling plan. Obtain the OC curve for the plan. Discuss the effect of n and c on the OC Curve.

b) Describe MIL STD – 105E. Explain the procedure for using it.

Q3) a) Distinguish between single sampling plan and double sampling plan. Derive the OC and ASN functions for double sampling plan.

b) Discuss the design of a single sampling plan for a specified OC curve. Describe sequential sampling plan.

Q4) a) Explain the merits and demerits of variable sampling plan. Describe sequential sampling plan by variables.

b) Give the description of MIL STD 414. Describe CSP-2 and CSP-3.

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Q5) a) Explain the design of variable sampling plan with a specified OC curve. Explain 6σ and its uses.

b) Explain CSP-1. Discuss Process Flow Diagram and Quality Function Deployment. What are their uses?

(DMSTT22)

Assignment-1
M.Sc. DEGREE EXAMINATION, MARCH – 2023
Second Year
STATISTICS
Operations Research
MAXIMUM MARKS: 30
Answer ALL Questions

Q1) a) Use simplex method to solve the following L.P.P:

Min $Z = x_1 - 2x_2 - 3x_3$

Subject to : $-2x_1 + x_2 + 2x_3 = 2$

$2x_1 + 3x_2 + 4x_3 = 1$

and $x_1, x_2, x_3 \geq 0$.

b) Use dual simplex method to solve the following L.P.P:

Max. $Z = -3x_1 - x_2$

Subject to $x_1 + x_2 \geq 1$

$2x_1 + 3x_2 \geq 2$

and $x_1, x_2 \geq 0$.

Q2) a) Use two – phase simplex method to solve the following L.P.P:

Min $Z = x_1 + x_2$

Subject to $2x_1 + x_2 \geq 4$

$x_1 + 7x_2 \geq 7$

and $x_1, x_2 \geq 0$.

b) Use dual simplex method to solve the following L.P.P:

Min $Z = 6x_1 + x_2$

Subject to $2x_1 + x_2 \geq 3$

$x_1 - x_2 \geq 0$

and $x_1, x_2 \geq 0$.

Q3) a) What are inventory models? Discuss the various costs involved in an inventory model.

b) Explain EOQ model with constant demand without shortages.

Q4) a) Explain the problem of EOQ with finite rate of replenishment.

b) Explain individual replacement policy.

Q5) a) Explain

i) two - person – zero – sum game.

ii) pure and mixed strategies.

iii) maximum and minmax principle and.

iv) dominance property.

b) Solve the following game by graphical method:

		Player B	
		B_1	B_2
Player A	A_1	1	–3
	A_2	3	5
	A_3	–1	6
	A_4	4	1
	A_5	2	2
	A_6	–5	0

(DMSTT22)

Assignment-2
M.Sc. DEGREE EXAMINATION, MARCH – 2023
Second Year
STATISTICS
Operations Research
MAXIMUM MARKS: 30
Answer ALL Questions

Q1) a) Use dominance to solve the following game:

Player	A	Player B B_1	B_2	B_3	B_4
	A_1	3	2	4	0
	A_2	3	4	2	4
	A_3	4	2	4	0
	A_4	0	4	0	8

b) Solve the following game by linear programming

Player	A	Player B B_1	B_2	B_3
	A_1	1	–1	3
	A_2	3	5	–3
	A_3	6	2	–2

Q2) a) Explain Queuing system. Describe the characteristics of the system.

b) Explain M|G|1 Queuing system. Obtain its steady state solution.

Q3) a) Explain M|M|1 system. Obtain its steady state solution. Find the waiting time distribution for the system.

b) Explain $M|E_k|1$ system. Obtain its steady state solution. Find the expected number of phases in the system.

Q4) a) Explain PERT|CPM network components and procedence relation ships. Summarize the rules for network construction.

b) Construct the network diagram and find the critical path from the following data pertaining to a small project:

Activity	Immediate Predecessor	Expected time (days)
A	-	5
B	A	7
C	B	2
D	B	3
E	C	1
F	D	2
G	C	1
H	E,F	3
I	G,H	10

What is the minimum time for completion of the project.

Q5) a) Distinguish between PERT and CPM. Explain the critical path analysis.

b) A small project has the following details:

Activity	Immediate Predecessor	Duration (Days)		
		Most likely	Optimistic	Pessimistic
A	-	3	1	7
B	A	6	2	14
C	A	3	3	3
D	B,C	10	4	22
E	B	7	3	15
F	D,E	5	2	14
G	D	4	4	4

Draw the network and find the critical path. Find the project completion time. What project duration will have 99% confidence of completion.

(DMSTT23)

Assignment-1
M.Sc. DEGREE EXAMINATION, MARCH – 2023
(Second Year)
STATISTICS
Econometrics
MAXIMUM MARKS: 30
Answer ALL Questions

Q1) a) Explain the simple linear model. Explain the properties of the model.

b) Obtain the least squares estimators of the constants in a simple linear model. Show that the estimators have minimum variance-property.

Q2) a) Explain log-linear and reciprocal models. Give their applications one each.

b) Develop a test statistic for testing the significance of the slop parameter.

Q3) a) Explain the general linear model. Obtain the OLS estimators of the parameters in the model.

b) State and prove Gauss – Markov theorem. Obtain an estimate of variance of the disturbance term.

Q4) a) Develop a test procedure for testing the significance of a subset of coefficients in the general linear model.

b) Explain the problem of prediction when the explanatory variables are uncertain.

Q5) a) Develop a test procedure for testing the general linear hypothesis.

b) Explain the role of dummy variables in regression models.

(DMSTT23)

Assignment-2
M.Sc. DEGREE EXAMINATION, MARCH – 2023
(Second Year)
STATISTICS
Econometrics
MAXIMUM MARKS: 30
Answer ALL Questions

Q1) a) Explain MWD test for choosing between linear and log-linear models.

b) Explain chow test.

Q2) a) Explain the problem of multi collinearity. What are its consequences? How do you resolve it?

b) Explain the generalized linear model. Obtain Aitken estimators. Develop a test procedure for testing a set of linear hypotheses based on GLS.

Q3) a) What is the problem of heteroscedasticity? What are its consequences?

b) Explain Goldfeld – Quandt test.

Q4) a) Define auto-correlation. Explain Durbin- Watson test.

b) Explain logit – model. Explain a method of estimating it.

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Q5) a) Describe the estimation procedure if the disturbances of the linear model follow ARCD process.

b) Explain

i) Linear probability model and

ii) Probit model. Describe the methods of their estimation.

(DMSTT24)

Assignment-1
M.Sc. DEGREE EXAMINATION, MARCH – 2023
Second Year
STATISTICS
Multivariate Analysis
MAXIMUM MARKS: 30
Answer ALL Questions

Q1) a) Define a p-variate normal distribution. Obtain its characteristic function.

b) Obtain the sampling distributions of sample mean vector and sample covariance matrix in a p-variate normal.

Q2) a) Obtain the distribution of a linear combination of a p-variate normal random variable.

b) Obtain the maximum likelihood estimators of the mean vector and the covariance matrix in a p-variate normal.

Q3) a) Derive the distribution of T^2.

b) Develop a test statistic to test for the difference of mean vectors in p-variate normal distributions.

Q4) a) Explain the mathematical model of M ANOVA for one-way classification. Explain the mathematical analysis of the model.

b) Explain the test to test the mean vector is a given vector in a multivariate normal.

Q5) a) What do you mean by a dimension reduction technique. Derive the expressions for the first and second principal components.

b) Explain orthogonal factor model. Explain the principal component method of parameter estimation.

(DMSTT24)

Assignment-2
M.Sc. DEGREE EXAMINATION, MARCH – 2023
Second Year
STATISTICS
Multivariate Analysis
MAXIMUM MARKS: 30
Answer ALL Questions

Q1) a) Explain the purpose of factor rotation. Explain orthogonal factor rotation and varimax factor rotation.

b) State and prove the properties of principal components.

Q2) a) Explain the problem of classification into one of two known multivariate normal populations.

b) Explain the problem of classification into one of several populations.

Q3) a) Explain the problem of classification into one of two populations with known probability distributions.

b) Explain the problem of classification into one of several multivariate normal populations.

Q4) a) Explain the concept of cluster analysis. Define similarity measures. Explain average linkage method.

b) Explain single linkage and K-means methods.

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Q5) a) Explain the difference between hierarchical and non-hierarchical methods of clustering. Explain k-means method.

b) Explain single linkage and average linkage methods of clustering.