(DMSTT21)

ASSIGNMENT-1

M.Sc. DEGREE EXAMINATION, MAY/JUNE-2025

Second Year

Statistics

STATISTICAL QUALITY CONTROL

MAXIMUM MARKS :30

ANSWER ALL QUESTIONS

1. (a) Explain the statistical basis of control charts. Discuss the role of control charts in manufacturing processes.

   (b) Explain the development and operation of $\overline{X}$ and S charts with constant and variable sample sizes.

2. (a) Explain median control chart and mid range control chart. Discuss their applications.

   (b) Explain O.C and ARL of $\overline{X}$ control chart. Describe the interpretation of $\overline{X}$ and R charts.

3. (a) Explain the development and use of p and np charts when standards given and not given. Describe the interpretation of p-chart.

   (b) What are natural tolerance limits and specification limits. Discuss different situations that arise. When natural tolerance limits are compared with the specified upper and lower specification limits.

4. (a) Explain C-Chart with fixed and varying sample sizes. Describe the interpretation of C-chart. Give the applications of the Chart.

   (b) Discuss in a general way how you would proceed to attain a state of statistical uniformity in a new production procecss so as to ensure conformity to given specification limits.

5. (a) What are the basic principles of consume control chart for monitoring the process mean?

   (b) Explain the construction of Hotelling's T^2 control chart.

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ASSIGNMENT-2

M.Sc. DEGREE EXAMINATION, MAY/JUNE-2025

Second Year

Statistics

STATISTICAL QUALITY CONTROL

MAXIMUM MARKS :30

ANSWER ALL QUESTIONS

1. (a) Explain the procedure for the construction of EWMA control chart.

   (b) Explain the ANOM for $\overline{X}$ and p charts. Describe one-way ANOM for variable data.

2. (a) Explain the advantages and disadvantages of sampling. Explain sequential sampling plan.

   (b) Explain designing a single sampling plan with a specified O.C. Curve. Describe the LTPD plan.

3. (a) Explain double sampling plan. Obtain its O.C. and ASN curves.

   (b) Describe MILSTD- 105 E sampling plan. Explain its use.

4. (a) Explain the advantages and disadvantages of variable sampling. Explain sequential sampling by variables.

   (b) Explain the techniques of TQM. What are the 6□ limits? What are their uses?

5. (a) Describe MIL-STD 414 sampling plan. Explain its use.

   (b) Explain

   (i) continuous sampling plans and

   (ii) Skiplot sampling plan.

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ASSIGNMENT-1

M.Sc. DEGREE EXAMINATION, MAY/JUNE-2025

Second Year

Statistics

OPERATIONS RESEARCH

MAXIMUM MARKS :30

ANSWER ALL QUESTIONS

1. (a) Define operations research. What are its characteristics and limitations?

   (b) Define general linear programming problem. Explain the graphical method of solving an LP problem.

2. (a) Explain the concept of duality. What are its properties? Explain dual simplex algorithm.

   (b) Use the phase simplex method to :

   Minimize : $Z = x_1 + x_2$

   Subject to: $2x_1 + x_2 \geq 4$

   $x_1 + 7x_2 \geq 7$

   and $x_1, x_2 \geq 0$.

3. (a) What is inventory? Why is it needed? Explain the costs involved in inventory control.

   (b) Explain EOQ model with finite rate of replenishment.

4. (a) Explain the fundamental problem of EOQ.

   (b) Explain the replacement policies of items that fail completely.

5. (a) Explain (i) two-person zero sum game (ii) Pay-off matrix (iii) maximin and minimax principle and (iv) dominance property.

   (b) Solve the following game graphically:

$$\begin{array}{c} \\ A \end{array} \begin{array}{c} \begin{array}{cccc} B & & & \end{array} \\ \begin{pmatrix} -6 & -1 & 4 & 3 \\ 7 & -2 & -5 & 7 \end{pmatrix} \end{array}$$

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ASSIGNMENT-2

M.Sc. DEGREE EXAMINATION, MAY/JUNE-2025

Second Year

Statistics

OPERATIONS RESEARCH

MAXIMUM MARKS :30

ANSWER ALL QUESTIONS

1. (a) Solve the following game:

$$\begin{array}{c} \\ A \\ \\ \\ \end{array} \begin{array}{c} B \\ \begin{pmatrix} 3 & 2 & 4 & 0 \\ 3 & 4 & 2 & 4 \\ 4 & 2 & 4 & 0 \\ 0 & 4 & 0 & 8 \end{pmatrix} \end{array}$$

(b) Explain the steps to reduce the game problem to a LP problem and explain the simplex method to obtain an optimum solution.

2. (a) Explain queuing process and the characteristics of a queuing system.

(b) Explain M/Ek/1 queuing system. Obtain its steady state solution. Find the average number of phases in the system.

3. (a) Explain M/M/S system and obtain its steady state solution. Find the performance measures of the system.

(b) Explain M/G/1 system. Derive the Pollaczek - Khin Chin formula.

4. (a) Distinguish between PERT and CPM. Explain the rules for dressing a network diagram.

(b) Draw the network diagram and find the minimum time of completion of the project from the following data:

Task :	A	B	C	D	E	F	G	H	I
Time :	8	10	8	10	16	17	18	14	9

5. (a) A project has the following details:

Estimated duration (weeks)

Activity	Immediate predecessor	Optimistic	Most likely	Pessimistic
A	–	1	1	7
B	A	1	4	7
C	–	2	2	8
D	B, C	1	1	1
E	C	2	5	14
F	A, C	2	5	8
G	D	3	6	15

Find the minimum time of completion of the project.

(b) From the following details of project draw the network diagram.

Activity	(1, 2)	(1, 3)	(2, 6)	(3, 4)	(3, 5)	(3, 6)	(4,5)	(5,6)
t_o	8	6	9	5	8	11	3	5
t_m	9	7	12	5	10	15	4	6
t_p	10	9	15	5	11	20	6	8

Find the probability of completing the project two days before the estimated time of completion.

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ASSIGNMENT-1

M.Sc. DEGREE EXAMINATION, MAY/JUNE-2025

Second Year

Statistics

ECONOMETRICS

MAXIMUM MARKS :30

ANSWER ALL QUESTIONS

1. (a) Explain simple linear regression and its properties.

   (b) Explain log-linear, reciprocal models and discuss their applications.

2. (a) Obtain the least squares estimators of the parameters in the two-variable model.

   (b) Explain the test of significance of the regression coefficient and the intercept.

3. (a) Explain the general linear model in detail and give its applications.

   (b) State and prove the Gauss – Markov theorem.

4. (a) Define multiple correlation coefficient and explain its use. What are its properties?

   (b) Construct confidence intervals for the parameter vector in the general linear model. How do you test for a subset of the coefficients?

5. (a) Discuss the method of estimation subject to linear restrictions.

   (b) Explain MWD test.

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ASSIGNMENT-2

M.Sc. DEGREE EXAMINATION, MAY/JUNE-2025

Second Year

Statistics

ECONOMETRICS

MAXIMUM MARKS :30

ANSWER ALL QUESTIONS

1. (a) Explain chow test.

   (b) What are Dummy variables? Explain their use in seasonal adjustments.

2. (a) What is meant by multi collinearity? What are its consequences? Describe its sources.

   (b) Explain generalised linear model. Obtain the generalised least squares estimators.

3. (a) Explain ridge regression and principal component regression methods. What are the limitations of the methods?

   (b) Explain the problem of heteroscelasticity and its consequences. Describe Breusch-Pegan-Godfrey test.

4. (a) What is autocorrelation? What are its sources and consequences? Describe D-W two step method as a namely for autocorrelation.

   (b) Explain

      (i) Linear probability model and

      (ii) Probit model.

5. (a) Explain Durbin-Watson test and its assumptions. What does p-value meum in the test?

   (b) Explain logit model. Obtain the estimators of the parameters write the steps for fitting the model.

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ASSIGNMENT-1

M.Sc. DEGREE EXAMINATION, MAY/JUNE-2025

Second Year

Statistics

MULTIVARIATE ANALYSIS

MAXIMUM MARKS :30

ANSWER ALL QUESTIONS

1. (a) Explain joint and marginal distributions of multivariate distributions.

   (b) Define multivariate normal distribution. Obtain its characteristic function.

2. (a) Obtain the m.l estimators of the mean vector and the covariance matrix of the multivariate normal.

   (b) Derive the distributions of the sample mean and sample covariance matrix.

3. (a) Derive the null distribution of hotelling T^2.

   (b) Explain MANOVA for one-way classification and its statistical analysis.

4. (a) Explain the test for testing the equality of two multivariate mean vectors.

   (b) Explain in detail the likelihood ratio principle and illustrate.

5. (a) Define the principal components. Derive the expression for the first and second principal components.

   (b) Explain the orthogonal factor model. Describe the methods of factor rotation.

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ASSIGNMENT-2

M.Sc. DEGREE EXAMINATION, MAY/JUNE-2025

Second Year

Statistics

MULTIVARIATE ANALYSIS

MAXIMUM MARKS :30

ANSWER ALL QUESTIONS

1. (a) Show that the principal components are uncorrelated.

   (b) Explain the principal component method of estimating the factor loadings.

2. (a) Explain the classification of two multivariate populations.

   (b) Explain fisher's method of discrimination among several multivariate populations.

3. (a) Explain Fisher's method of discrimination between two multivariate populations.

   (b) What are the standards of good classification? Derive fisher's linear discriminant function.

4. (a) Distinguish between hierarchical and non-hierarchical clustering methods. Explain the sequence of steps in non-hierarchical clustering.

   (b) Explain the various similarity measures.

5. (a) Explain linkage methods of clustering.

   (b) Explain k-means clustering.

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