

(DMSTT 21)

M.Sc. DEGREE EXAMINATION,
NOVEMBER 2021.
Second Year
Statistics
STATISTICAL QUALITY CONTROL

Time : Three hours

Maximum : 70 marks

Answer any FIVE questions.
All questions carries equal marks.

1. (a) Explain Shewart control chart for individual measurements in detail.
(b) What is a control chart? Explain its uses in economics.
2. (a) Discuss the economic model of \bar{X} chart.
(b) Explain OC and ARL curves for \bar{X} -chart. Explain their usage.
3. (a) What is control charts for attributes? Explain.
(b) Calculate the control limits for the fraction defectives of a production line, where from 28 lots of 200 items each gave an average fraction defective of 0.04. The producer's risk is 0.03.
4. (a) Explain in detail about on tolerance limits and specification limits.
(b) Write the procedure of C-chart with fixed and varying samples sizes.
5. (a) Explain CUSUM chart. How do you improve CUSUM responsiveness for large shifts? What are the disadvantages of V-mask procedure?
(b) Discuss the analysis of means for variable data for two factor analysis.
6. (a) Explain in detail about multivariate quality for control charts.
(b) Discuss the ANOM for \bar{X} -chart and P-chart.

7. (a) Explain the method of sequential sampling plans for attributes.
(b) Explain the concepts of
 - (i) Producer's risk
 - (ii) Consumer's risk with examples.
 8. (a) Differentiate between single sampling and double sampling plan. Also derive OC and ASN functions for single sampling plan.
(b) Discuss about the procedure of MILSTE – 105E in detail.
 9. (a) What is 6σ concept? Explain its uses. Also write the principles of total quality management.
(b) Explain the procedure of chain sampling.
 10. (a) Explain the approaches of variable sampling.
(b) Explain the role of CSP-2 and CSP-3.
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(DMSTT 22)

M.Sc. DEGREE EXAMINATION,
NOVEMBER 2021.

Second Year

Statistics

OPERATIONS RESEARCH

Time : Three hours

Maximum : 70 marks

Answer any FIVE questions.

All question carries equal marks.

1. (a) Define a general LPP. Prove that if LPP has a feasible solution, then it also has a basic feasible solution.
(b) What are artificial variables? Why do we need them? Explain the Big-M method of solving on LPP.
2. (a) What is meant by dual problem? Show that dual of a dual is primal.
(b) Determine the dual and solve the following LPP
Minimize $z = 2x_1 + 9x_2 + x_3$
Subject to the conditions $x_1 - 2x_2 \geq 2$
 $x_1 + 2x_2 = 8$
 $x_1 - x_2 \leq 10$,
 $x_1, x_2 \geq 0$
3. (a) Discuss the replacement procedure for items that deteriorate with time.
(b) Explain the problem of purchase inventory. Derive the optimum order quantity with one price break.
4. (a) A contractor has to supply 10,000 bearings per day to manufacturers. He finds that, when he starts a production run, he can produce 25,000 bearings per day. The cost of holding a bearing in stock for one year is 20 paise, and set-up cost of production run is Rs.180.00. How frequently should production run be made.
(b) Define the terms safety stock and EOQ with the help of an ideal inventory model.

5. (a) Explain the maximum principle of game theory.
 (b) Solve the following game by dominance method

	Player B		
Player A	15	2	3
	6	5	7
	7	4	0

6. (a) Explain the difference between pure strategy and mixed strategy.
 (b) Solve the following 2×4 game for multiple solutions by graphical method.

	A's payoff			
	B's strategies			
A's strategies	1	2	3	4
1	2	2	3	-1
2	4	3	2	6

7. (a) Explain the terminologies of queueing system.
 (b) Explain the following
- (i) Service discipline
 - (ii) Service distribution
 - (iii) Service channel
8. (a) Explain about various assumptions made in single-channel queueing theory.
 (b) The man arrived rate to a service center in 3 per hour, the mean service time is found to be 10 min per service, assuming Poisson arrival and exponential service time, find
- (i) Probability of two units in the system
 - (ii) Expected no. of units in the queue.
 - (iii) Expected time in minutes that customer has to spend in the system.

9. (a) What is the difference between PERT and CPM.
 (b) Consider the following data for the activities of a project.

Activity :	A	B	C	D	E	F
Predecessor :	-	A	A	B,C	-	E
Duration (in days)	2	3	4	6	2	8

Draw the network and find critical path and project duration.

10. Following an the activity of a project

Activity	A	B	C	D	E	F	G	H	I
Proceeding	-	-	A	A	C	D	B	E,F	G
a	4	1	6	2	5	3	3	1	4
m	7	5	12	5	11	6	9	4	19
b	16	15	30	8	17	15	27	7	28

- (a) Draw the network diagram
 (b) Find out initial path and project duration
 (c) If project manager wishes to be 99% sure that the project is completed on 30th March, 2017, When should be start the project work?

(DMSTT 23)

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ECONOMETRICS

Time : Three hours

Maximum : 70 marks

Answer any FIVE questions.

All questions carry equal marks.

1. (a) Distinguish between linear and non-linear regression models.
(b) Obtain the least square estimator of β in the simple linear model $Y = XB + E$ and show that the least square estimator is BLUE.
2. (a) Develop a test statistic for testing the significance of the slope parameter.
(b) Explain the test procedure to test the function form of a regression model.
3. (a) State and prove Gauss-Markov theorem.
(b) Explain about OLS estimation.
4. (a) What is multiple correlation co-efficient (R)? Explain its role in regression model.
(b) Obtain the least squares estimators of the parameters in the two-variable linear model.
5. (a) Explain the role of dummy variables in regression model.
(b) Develop a test procedure for testing the general linear hypothesis.
6. (a) Explain MWD test. What are dummy variables? Explain their use.
(b) Explain the method of estimation subject to linear restrictions in the GLM.

7. (a) What is heteroscedasticity? What are its sources? What are its consequences? Explain Goldfield-Quandt test.
(b) What are the assumptions of generalized least square method?
 8. (a) What is multicollinearity? State different solutions for multicollinearity.
(b) What are the sources of multicollinearity? What are its consequences? Explain principal component regression method.
 9. (a) What is auto-correlation? What are its consequences? Explain the two tests for its detection.
(b) Explain about PROBIT model. How do you estimate the model?
 10. (a) Write the structure of linear probability model. Explain its features.
(b) Explain auto correlation. Explain Durbin–Watson test.
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(DMSTT 24)

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Statistics

MULTIVARIATE ANALYSIS

Time : Three hours

Maximum : 70 marks

Answer any FIVE questions.

All questions carry equal marks.

1. (a) Prove that the marginal distributions and conditional distributions derived from a p-variate normal distribution are also normal.
(b) Let X be a p-variate normal random vector. State and prove a necessary and sufficient condition for one subset of the random variables and the subset consisting of the remaining variables to be independent.
2. (a) Obtain the ML estimates of the mean vector and the covariance matrix in a p-variate normal.
(b) Obtain the distributions of a sample mean and sample co-variance matrix in a p-variate model.
3. (a) Derive the null distribution of Hotelling T^2 statistic.
(b) Discuss the statistical analysis of MANOVA for one-way classification.
4. (a) Evaluate T^2 . for testing $H_0 : \mu = [3, 9]$ using the data $X = \begin{bmatrix} 12 & 8 & 6 & 8 \\ 12 & 9 & 9 & 10 \end{bmatrix}$.
(b) Develop a test statistic for testing the hypothesis that the mean vector is a given vector. Obtain the confidence region for the mean vector.
5. (a) Discuss the procedure for obtaining the first principal component.
(b) What is factor analysis? Explain the procedure of factor analysis.

6. (a) Define first K principal components. Explain the method of computing principal components from a given sample variance – covariance matrix.
(b) What is the purpose of factor rotation? Explain orthogonal factor rotation and oblique factor rotation.
 7. (a) Explain the problem of classification into one of the several known multivariate normal populations and obtain the linear discriminant functions.
(b) What is discriminant analysis? Explain how it is different from factor analysis.
 8. (a) Discuss the Fisher's method for classification into one of several problems.
(b) Explain about the computation of linear discriminant function.
 9. (a) Explain the hierarchical clustering methods and their merits and demerits.
(b) Explain about the Non-hierarchical clustering methods.
 10. (a) Discuss about the similarity measures.
(b) What is cluster analysis? Explain its procedure.
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