(DMSTT21)

Total No. of Questions : 10] **[Total No. of Pages : 02**

M.Sc. DEGREE EXAMINATION, DEC. – 2016

Second Year

STATISTICS

Statistical Quality Control

Time : 3 Hours **Maximum Marks : 70**

Answer any five questions.
All questions carry equal marks.

Q1) a) Explain the role and importance of statistical quality control in industry.

b) Explain the construction of $\bar{X}$ chart. Discuss the analysis of patterns on control charts.

Q2) a) Explain the statistical basis of control charts. Describe the construction of midrange control chart. What are its uses?

b) Explain the construction of median and standard deviation control charts. Obtain OC and ARL functions. Describe the features of OC functions.

Q3) a) Explain the development and operation of P-chart for fixed and variable sample sizes. How do you measure the sensitivity of the Control Chart?

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

Q4) a) Explain the construction of Control Charts for number of defects per unit. Give any four applications of it.

b) Discuss the underlying theory of *p* and *np* charts. Under what situations in industry would you prefer the one to the other?

Q5) a) How do you use EWMA Control Chart? Illustrate a situation where EWMA Control Chart is superior to CUSUM Chart.

b) Explain two factor analysis for process control with a suitable example.

Q6) a) Explain moving average control chart. Derive its OC function.

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

Q7) a) Distinguish between producer's risk and consumer's risk. Explain AQL and LTPD. Describe sequential sampling plan.

b) Explain single sampling plan. Derive its OC and ASN functions.

Q8) a) Define double sampling plan. Obtain its OC and ASN functions.

b) Explain AOQL and LTPD. Discuss Dodge and Romig sampling plan and their use.

Q9) a) Give the general description of MIL-STD 414. Describe the procedure for using it.

b) Explain Chain sampling and CSP-1.

Q10) a) Explain the approaches of variable sampling plans with a specified OC curve. Describe MIL-STD 1235b.

b) Explain the concept of 6σ and its uses. What are the principles of total quality management? Explain the use of design of experiments in total quality management.

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(DMSTT22)

Total No. of Questions : 10] **[Total No. of Pages : 03**

M.Sc. DEGREE EXAMINATION, DEC. – 2016

Second Year

STATISTICS

Operations Research

Time : 3 Hours **Maximum Marks : 70**

Answer any five questions.
All questions carry equal marks.

Q1) a) Solve the following L.P.P by using simplex method.

Max. $Z = 3x_1 + 2x_2$

Subject to $2x_1 + x_2 \leq 2$

$3x_1 + 4x_2 \geq 12$

and $x_1, x_2, \geq 0$.

b) Use dual simplex method to solve :

Min. $Z = 6x_1 + 7x_2 + 3x_3 + 5x_4$

Subject to $5x_1 + 6x_2 - 3x_3 + 4x_4 \geq 12$

$x_2 + 5x_3 - 6x_4 \geq 10$

$2x_1 + 5x_2 + x_3 + x_4 \geq 8$

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

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

Max. $Z = 3x_1 - x_2$

Subject to $2x_1 + x_2 \geq 2$

$x_1 + 3x_2 \leq 2$

$x_2 \leq 4$

and $x_1, x_2, \geq 0$.

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

Max. $Z = -2x_1 - x_2$

Subject to $3x_1 + x_2 \geq 3$

$4x_1 + 3x_2 \geq 6$

$x_1 + 2x_2 \geq 3$

and $x_1, x_2, \geq 0$.

Q3) a) What are the advantages and disadvantages of increased inventory? Explain the different costs that are involved in the inventory problems.

b) Explain the fundamental problem of EOQ and determine the economic lot size formula.

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

b) Explain the problem of replacement of items whose maintenance costs increase with time; and the value of money also changes with time.

Q5) a) Explain (i) two-person-zero sum game (ii) saddle point (iii) pure and mixed strategies and (iv) dominance property.

b) Solve the following game by algebraic method :

$$\begin{pmatrix} 0 & -4 & -10 \\ 3 & 0 & 5 \\ 8 & 1 & 0 \end{pmatrix}$$

Q6) a) Solve the following game by graphical method :

Player A	Player B	
	B_1	B_2
A_1	–6	7
A_2	4	–5
A_3	–1	–2
A_4	–2	5
A_5	7	–6

b) Solve the following game by linear programming :

$$\begin{pmatrix} 90 & 80 & 110 \\ 110 & 100 & 90 \\ 120 & 70 & 80 \end{pmatrix}$$

Q7) a) Explain the basic queuing process. Describe the characteristics of a queuing system.

b) Explain M|M|S system. Obtain its steady state solution. Find the expected waiting time of a customer in the system.

Q8) a) Explain M|G|1 system. Obtain its steady state solution.

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

Q9) a) Explain basic logic of arrow networks. Discuss various steps involved in the applications of PERT and CPM.

b) A small project has the following details :

Activity	:	A	B	C	D	E	F	G
Immediate Predecessor	:	–	–	A	A,B	C,D	B,D	E,F
Time (days)	:	2	1	3	2	1	3	1

Draw the network diagram. Find the critical path. Calculate total float and free float for each activity.

Q10) a) Distinguish between PERT and CPM. Discuss the role of statistical techniques in PERT.

b) The following are the details of a project :

Activity	Immediate Predecessor	Activity time (weeks)		
		Optimistic	Most likely	Pessimistic
A	–	1	3	5
B	–	2	4	6
C	A	3	5	7
D	A	5	6	7
E	C	5	7	9
F	D	6	8	10
G	B	7	9	11
H	E,F,G	2	3	4

Draw the network and find the critical path. Calculate the project completion time. Find the due date to have 0.95 probability of completion.

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Total No. of Questions : 10] **[Total No. of Pages : 02**

M.Sc. DEGREE EXAMINATION, DEC. – 2016

Second Year

STATISTICS

Econometrics

Time : 3 Hours **Maximum Marks : 70**

Answer any five questions.
All questions carry equal marks.

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

b) Obtain the least squares estimators of the parameters in the simple linear model. Obtain the estimate of variance of the disturbance term.

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

b) Develop test statistics for testing the significance of slope and Intercept parameters.

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

b) Show that OLS estimators are B.L.U.Es. Obtain an estimate of variance of the disturbance term.

Q4) a) Develop a test procedure to test for the significance of complete regression.

b) Obtain the interval forecasts for the dependant variable in a general linear model.

Q5) a) Obtain restricted least squares estimators. Develop a test procedure for testing a set of linear restrictions.

b) Explain Chow test.

Q6) a) What are dummy variables? Explain their role in regression models.

b) Explain MWD test.

Q7) a) What is multi collinearity? What are its consequences? Explain ridge regression and its use.

b) Explain generalized linear model. Obtain the Aitken estimators. Explain testing a set of linear hypothesis using generalized least squares.

Q8) a) What is the problem of heteroscedasticity? What are its consequences?

b) Explain estimation under heteroscedasticity. Explain Breusch-Pagan test.

Q9) a) Define auto-correlation, what are its sources? Explain a test procedure for detecting the presence of auto correlation.

b) Explain logit model. Explain a method of estimating the model.

Q10) a) Discuss Cochran-Orcutt procedure.

b) Explain (i) linear probability model and (ii) probit model. Describe the methods of estimating the models.

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Total No. of Questions : 10] **[Total No. of Pages : 02**

M.Sc. DEGREE EXAMINATION, DEC. – 2016

Second Year

STATISTICS

Multivariate Analysis

Time : 3 Hours **Maximum Marks : 70**

Answer any five questions.
All questions carry equal marks.

Q1) a) Define a p-variate normal distribution. Show that the marginal distribution and conditional distribution of any set of components of a p-variate normal random variable are also a multivariate normal.

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

Q2) a) Obtain the characteristic function of a p-variate normal.

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

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

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

Q4) a) Explain the mathematical model of MANOVA for one-way classification.

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

Q5) a) Derive the expressions for first and second principal components.

b) What is the purpose of factor notation? Explain orthogonal factor notation and oblique factor notation.

Q6) a) State and prove the properties of principal components.

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

Q7) a) Explain the procedure of classification into one of two populations with known probability distributions.

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

Q8) 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.

Q9) a) Explain the concept of cluster analysis. Explain K-means method.

b) Explain single linkage, complete linkage and average linkage methods.

Q10) a) Distinguish between hierarchical and non-hierarchical methods of clustering. Explain K-means method of clustering.

b) Explain single linkage, complete linkage and average linkage methods.

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