M.Sc. DEGREE EXAMINATION, MAY – 2018
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 control charts for variables. Write the LCL, UCL for $\overline{X}$, $\overline{R}$ – charts.

Q2) a) Explain OC and ARL curves for $\overline{X}$ – chart. Explain their usage.
   b) Explain about mid range control chart and standard deviation chart.

Q3) a) Derive ARL of a CUSUM chart.
   b) Write the procedure of constructing np – chart.

Q4) a) Write a note on natural tolerance limits and specification limits.
   b) Write the procedure of C-chart with fixed and varying sample sizes.

Q5) a) Explain EWMA control charts. Also explain its applications.
   b) Discuss the analysis of mean for variable data for two factor analysis.

Q6) a) What is multivariate quality for control charts? Explain any one of technique.
   b) Discuss the ANOM for $\overline{X}$-chart and P-chart.

Q7) a) Explain the concepts
      i) producer's risk
      ii) consumer's risk with examples.
   b) Discuss the method of sequential sampling plans for attributes.

Q8) a) Differentiate between single sampling plan and double sampling plan. Also derive OC and ASN functions for single sampling plan.
   b) Write the procedure of Dodge and Roaming plans.

Q9) a) Explain the approaches of variable sampling plans with a specified OC curve. Also describe MIL-STD 1235 b.
   b) What is 6σ concept? Explain it's uses. Also write the principles of total quality management.

Q10) a) Explain the role of CSP-2 and CSP-3.
   b) Explain continious sampling plans in brief.

✦ ✦ ✦ ✦

(DMSTT22)

M.Sc. DEGREE EXAMINATION, MAY – 2018
Second Year
STATISTICS
Operations Research

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

Answer any five questions.
All questions carry equal marks.

(5×14=70)

Q1) a) Define operations research. Explain the significance of O.R. models.

b) Use simplex method to solve the following L.P.P. Minimize (z) = $x-3y$; Subject to the conditions $x + y \le 300; x - 2y \le 200; 2x + y \ge 100; x_1 x_2 \ge 0$.

Q2) a) Use Big-M method to solve the following L.P.P. Minimize (z) = $2x_1 + 9x_2 + x_3$; subject to the conditions $x_1 + 4x_2 + 2x_3 \ge 5$; $3x_1 + x_2 + 2x_3 \ge 4$; $x_1, x_2, x_3 \ge 0$.

b) Determine the dual and solve the following L.P.P. Maximize (z) = $4x_1 + 2x_2$; subject to the conditions $x_1 - 2x_2 \ge 2$; $x_1 + 2x_2 = 8$; $x_1 - x_2 \le 10$; $x_1, x_2 \ge 0$.

Q3) a) Distinguish between deterministic and stochastic models in inventory.

b) Annual demand for an item is 500 units, ordering cost is Rs.18 per order. Inventory carrying cost is Rs.15 per unit per year relationship between price and quantity ordered is as follows:

Quantity ordered	1 to 15	16 to 149	150 to 549	550 & over
Price per unit (Rs.)	10	9	8.75	8.50

Specify optimal order quantity and the corresponding price of this item.

Q4) a) Discuss in brief the replacement procedure for items that deteriorate with time.

b) The yearly cost of two machines A and B, when money value is neglected is shown below. Find their cost patterns if money is worth 10 percent per year and hence find which machine is more economical.

Year	1	2	3
Machine A (Rs.)	1800	1200	1400
Machine B (Rs.)	2800	1200	1400

Q5) a) Explain various quantitative methods which are useful for decision-making under uncertainty.

b) Solve the following game by dominance method.

Player B

$$\text{Player A} \begin{pmatrix} 15 & 2 & 3 \\ 6 & 5 & 7 \\ -7 & 4 & 0 \end{pmatrix}$$

Q6) a) Explain the difference between pure strategy and mixed strategy.

b) Solve the following game by Linear programming approach.

Player B

$$\text{Player A} \begin{pmatrix} 9 & 1 & 4 \\ 0 & 6 & 3 \\ 5 & 2 & 8 \end{pmatrix}$$

Q7) a) Brief explain the important characteristics of queuing system.

b) The mean arrival rate to a service center is 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.

Q8) a) Write a short note on M/M/1 queue and its applications.

b) In a railway marshalling yard, goods trains arrive at a rate of 30 trains per day. Assume that the inter arrival time follows an exponential distribution and the service time distribution is also exponential with an average of 36 minutes. Calculate

i) The probability that the yard is empty.

ii) Average queue length assuming that the line capacity of the yard is 9 trains.

Q9) 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.

Q10) a) Explain the uses of CPM/PERT.

b) Following are the activities 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

i) Draw the network diagram.
ii) Find out critical path and project duration.
iii) If project manager wishes to be 99% sure that the project is completed on 30th March, 2017, when should he start the project work?

✦✦✦✦

(DMSTT23)

Total No. of Questions : 10]   [Total No. of Pages : 01

M.Sc. DEGREE EXAMINATION, MAY – 2018
Second Year
STATISTICS
Econometrics

Time : 3 Hours   Maximum Marks :70

Answer any five questions.
All questions carry equal marks.

Q1) a) Define simple Regression Analysis? Explain its practical applications.
   b) Obtain the least square estimator of β in the simple linear model $Y = X\beta + E$ and show that the least square estimator is BLUE.

Q2) a) Write the procedure of log linear regression model.
   b) Develop a test statistic for testing the significance of the slop parameter.

Q3) a) State and prove Gauss Markov theorem.
   b) Explain the general linear model. Obtain the OLS estimators of the parameters in the model.

Q4) a) What is multiple correlation co-efficient (R)? Explain its role in regression model.
   b) Define R and R^{-2}. Explain the importance of these in the model.

Q5) a) Explain the role of dummy variables in regression models.
   b) Develop a test procedure for testing the general linear hypothesis.

Q6) a) Explain MWD test for choosing between Linear and Log-Linear models.
   b) Explain chow-test procedure.

Q7) a) Explain any two tests for the detection of heteroscedasticity.
   b) What are the assumptions of generalized least squares method.

Q8) a) What is the problem of heteroscedasticity? How do you resolve heteroscedasticity.
   b) What is multicollinearity? State different solutions for multi collinearity.

Q9) a) Explain about PROBIT model. How do you estimate the model.
   b) Explain Auto correlation? Explain Dubin-Watson test.

Q10) a) Explain about LOGIT Model in brief.
   b) Write the structure of linear probability model. Explain its features.

✦✦✦✦

M.Sc. DEGREE EXAMINATION, MAY – 2018
Second Year
STATISTICS
Multivariate Analysis

Time : 3 Hours   Maximum Marks :70

Answer any five questions.
All questions carry equal marks.

Q1) a) What is multivariate normal Distribution? Explain its properties.

b) Obtain maximum likelihood estimators of mean vector in a P-variate normal.

Q2) a) State and prove a necessary and sufficient conditions for one set of random variables and subset consisting of the remaining variables in a P-variate normal to be independent.

b) Obtain the distributions of sample mean and sample covariance matrix in a P-variate model.

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

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.

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

b) Evaluate T^2, for testing $H_0 : \mu = [3,9]$ using the data $X = \begin{bmatrix} 12 & 8 & 6 & 8 \\ 12 & 9 & 9 & 10 \end{bmatrix}$.

Q5) a) Explain oblique rotation and orthogonal rotation of factors.

b) What is factor analysis? Explain the procedure of factor analysis.

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

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

Q7) a) What is discriminant analysis? Explain how it is different from factor analysis.

b) Discuss the Fisher's method for classification into one of several problems.

Q8) a) Discuss the problem of classification with several multivariate normal populations.

b) If B is defined as $c(\mu_1 - \mu_2)(\mu_1 - \mu_2)'$ for some constant e, verify that $e = c\Sigma^{-1}(\mu_1 - \mu_2)$ is infact an Eigen vector of $\Sigma^{-1}B$, where Σ is an covariance matrix.

Q9) a) What is cluster analysis? Explain its procedure.

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

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

b) Discuss the similarity measures.

✦✦✦✦