M.Sc. DEGREE EXAMINATION, DECEMBER – 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 use and interpretation of Operating Characteristic function.

b)   Explain the construction and operation of Median and Mid range Control charts.

Q2) a)   Explain Mid Range Control Chart and Standard Deviation Control Chart.

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

Q3) a)   Explain the difference between Natural tolerance limits and specification limits.

b)   Explain the procedure of construction of C-chart. Give its applications.

Q4) a)   Explain the procedure of np-chart with fixed and Varying sample sizes.

b)   Explain different charts to used for attributes.

Q5) a)   How do you use EWMA Control Chart? Explain with an example where EWMA Control Chart is superior to CUSUM Chart.

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

Q6) a)   Explain Hotelling T_2 Control Chart. Explain its uses.

b)   Discuss Chi-square Control Charts.

Q7) a)   Describe MILSTD-105E procedure in brief.

b)   Explain the elements of AOQL in Continuous Sampling plan.

Q8) a) Define Single Sampling Plan. Obtain its OC functions.

b) Explain AOQL and LTPD. Discuss Dodge and Roaming Sampling Plan and their uses.

Q9) a) Write the General Description and uses of MIL-STD-414.

b) What is Skiplot Sampling Plan? Explain with an example.

Q10) a) Explain the tools and techniques of TQM in brief.

b) What is six Sixma? Why it is needed to implement six sigma in the organizations.

✳ ✳ ✳

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

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

<u>***Answer any Five questions***</u>   *[5 × 14 = 70]*
<u>***All questions carry equal marks***</u>

Q1) a) What is Linear programming? Explain its applications.

     b) Solve the following L.P.P by Simplex method.
Maximize $(Z) = 4x_1 + 6x_2 + 2x_3$;
Subject to the conditions
$x_1 + x_2 + x_3 \leq 3$;
$x_1 + 4x_2 + 7x_3 \leq 9$;
$x_1, x_2, x_3 \geq 0$.

Q2) a) What is Duality? Explain the rules for converting primal into its Dual.

     b) Write the Dual and solve the following L.P.P.
Maximize $(Z) = 2x_1 + 5x_2 + 3x_3$;
Subject to the conditions
$2x_1 + 4x_2 - 3x_3 \leq 8$;
$-2x_1 - 2x_2 + 3x_3 \geq -7$
$x_1 + 3x_2 - 5x_3 \geq -2$;
$4x_1 + x_2 + 3x_3 \leq 4$;
$x_1, x_2, x_3, x_4 \geq 0$.

Q3) a) What are the types of Inventory? Why are they maintained? Explain the various costs related to Inventory.

     b) A manufacturer has to supply his customers 600 units of his product per year. Shortages are not allowed and the shortage cost amounts to Rs. 0.60 per unit per year. The set-up cost per run is Rs. 80. Find the optimum *ru* size and minimum average yearly cost.

Q4) a) Give a brief account of situations in which replacement problems arise. What does the theory of replacement establish?

b) A firm is considering replacement of a machine whose cost price is Rs. 12,200 and scrap value is Rs. 200. The maintenance costs are found from experience to be as follows :

Year	1	2	3	4	5	6	7	8
Maintenance Cost (Rs.)	200	500	800	1200	1800	2500	3200	4000

When should the machine replaced?

Q5) a) What are the properties of a Game? Explain the 'Best Strategy' on the basis of Minimax criterion of optimality.

b) Solve the following whose pay-off Matrix is given by

Player B

$$\text{Player A} \begin{pmatrix} 1 & 7 & 3 & 4 \\ 5 & 6 & 4 & 5 \\ 7 & 2 & 0 & 3 \end{pmatrix}$$

Q6) a) State the major limitations of Game Theory.

b) Solve the following game by Graphical method

Player B

$$\text{Player A} \begin{pmatrix} -1 & 2 & 2 \\ 6 & 4 & -6 \end{pmatrix}$$

Q7) a) Draw a diagram showing the physical layout of a queuing system with multi-server multi-channel service facility.

b) A Super market has a single cashier. During peak hours, customers arrive at a rate of 20 customers per hour. The average number of customers that can be processed by the cashier is 24 per hour.

Calculate :

i) The probability that the cashier is idle.

ii) The avg number of customers in queue system.

iii) The avg number of customers in queue.

iv) The avg time a customer spends in the queue waiting for service.

Q8) a) Show that the distribution of the number of births up to time T in a simple birth process follows the Poisson law.

b) At what average must a clerk at a super market work in order to ensure a probability of 0.90 that the customer will not have to wait longer than 12 minutes? It is assumed that there is only one customer to which customers arrive in a Poisson fashion at an average rate of 15 per hour. The length of service by the clerk has an Exponential Distribution.

Q9) a) What are the rules of network construction?

b) A Project Schedule has the following activities

Activity	1-2	1-3	2-4	3-4	3-5	4-9	5-6	5-7	6-8	7-8	8-10	9-10
Time (days)	4	1	1	1	6	5	4	8	1	2	5	7

i) Construct a network diagram.

ii) Find the Critical Path and Project Duration.

Q10) a) What is the difference between CPM and PERT?

b) A small project is composed of activities whose time estimates are listed below :

i-j	1-2	1-3	1-4	2-5	3-5	4-6	5-6
Optimistic time	1	1	2	1	2	2	3
Most likely time	1	4	2	1	5	5	6
Pessimistic time	7	7	8	1	14	8	15

i) Draw the network.

ii) Find the Expected Duration and Variance of Critical Path.

iii) What is the probability that the project will be completed at least 4 weeks earlier than expected?

※ ※ ※

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

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

__Answer any Five questions__   *[5 × 14 = 70]*
__All questions carry equal marks__

Q1) a)   Explain Log-linear and reciprocal models. Explain its applications.

b)   What is Simple Linear Model? Write its Assumptions.

Q2) a)   List out properties of Linear Regression and Semi Regression Models.

b)   Explain the principle of Least Squares. Explain with an example.

Q3) a)   State and prove Gauss-Markov theorem.

b)   What is Multiple Regression? Explain the applications of Multiple Regression.

Q4) a)   Define R^2 and R^{-2}. Explain the importance of these in the model selection.

b)   Explain the general Linear Model. Obtain the OLS Estimators of the parameters in the Model.

Q5) a)   Explain the procedure of Chow-test for Equality of two variables.

b)   Discuss the technique of using dummy variables for testing structural differences.

Q6) a)   Obtain restricted least square Estimators. Develop a test procedure for testing a set of Linear Restrictions.

b)   Explain NWD test for choosing between Linear and non-linear Models.

Q7) a) What is the problem of Multicollinearity? What are its sources and consequences? Discuss the remedies for Multicollinearity.

b) Explain the problem of heteroscedasticity. Describe any method to overcome the problem of heteroscedasticity.

Q8) a) What are the assumptions of Generalised Least Squares Method.

b) Explain any two tests for the detection of heteroscedasticity.

Q9) a) What is Searial Correlation? Give its nature and consequences.

b) Explain LOGIT Model. Discuss a method of Estimating the same.

Q10) a) Explain about Qualitative Response Regression models and give its merits and drawbacks.

b) Explain Linear Probability Model (LPM). How do you estimate the model.

✳ ✳ ✳

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

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

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

Answer any Five questions

All questions carry equal marks

Q1) a) Explain Marginal, Joint and Conditional distributions with examples.

b) Show that the Conditional Distribution of Multivariate Normal Distribution.

Q2) a) Obtain the Maximum Likelyhood Estimators, μ, variance in multivariate normal distribution.

b) Let (x,y) be jointly distributed with density $f(x, y) = y(1 + x)^{-4} \, \text{Exp} \, (-y(1+x)^{-1})$, $x, y \geq 0$. Find $E(x^n y^n)$ and $E(y/x)$.

Q3) a) Explain the procedure of MANOVA for one-way classification.

b) Define Hotelling's T^2 Statistic. Derive its Distribution.

Q4) a) Develop a test statistic to test the difference of Mean vectors in P-variate Normal Distribution.

b) Write the Applications of T^2 test statistic .

Q5) a) Explain the orthogonal factor model. Explain the principal component method of Parameter Estimation.

b) State and prove the properties of Principal components.

Q6) a) Explain various methods of Estimation in brief.

b) Write the concept of Factor Analysis. Explain the procedure of Factor analysis.

Q7) a) Discuss the problem of classification between two multivariate Normal Distributions.

b) Discuss tests associated with Discriminant analysis.

Q8) a) Explain the procedure of classification into one of two populations with known Probability Distributions.

b) Explain the Fisher's Discriminate function in brief.

Q9) a) Explain the applications of Cluster Analysis. List out its merits and drawbacks.

b) Explain K-Means Method. What are the disadvantages of non-hierarchical methods.

Q10) a) Explain Single Linkage and Average Linkage Methods of clustering.

b) Discuss the Agglomerative methods of clustering.

✳ ✳ ✳