UTTER PRADESH RAJARSHI TANDON OPEN UNIVERSITY, PRAYAGRAJ

Assignment Session-2020-21

Course Code: PGSTAT-01/MASTAT-01 (NEW) PGSTAT-02/MASTAT-02 (OLD)	Course Title: Probability and Distribution	Maximum Marks: 30

Section -A

Long Answer Questions

Note: Attempt any three questions. Each question should be answered in 800 to 1000 Words.

Maximum Marks: 18

1. State and prove Lindeberg Levy Central Limit Theorem?
2. Discuss about the Weak Law of Large Numbers?
3. State and prove Chauchy Schwartz Inequality?
4. State and prove Kolmogorov Inequality?
5. Write down the axiomatic definition of probability? Let A, B and C be three events?
6. Prove that -

(i) $P(A \cup B \cup C) = P(A)+P(B)+P(C)$

(ii) Provided, $A \cap B=\Phi$, $B \cap C=\Phi$, $A \cap C=\Phi$

(iii) For any event A, $0 \leq P(A) \leq 1$

7. Define characteristic function of random variable? State some of its important properties?
8. Discuss WLLN? How is it different from SLLN and CLT?
9. Discuss various probability axiom and their consequences is detail?
10. Discuss about the Decomposition of distribution function. And also state and prove Inverse theorem?
11. State and prove Helly Bray theorem?
12. State and prove Khinchin's theorem? Explain whether it can be applied?
13. What is characteristic function of a random variable? Is it exists for Cauchy distribution?

Section - B

Short Answer Questions

Note: Attempt any four questions. Answer should be given in 200 to 300 Words.

Maximum Marks: 12

1. Discuss about the Zero One law?
2. Discuss about the random variable and its type?
3. Does the WLLN holds for the sequence $\{X_k\}$? Such that $P\{X_k = \pm 2^k\} = \frac{1}{2}$?
4. Let $\{X_n\}$ be a strictly decreasing sequence of random variables which assume positive values only and suppose that $X_n \xrightarrow{a.s.} 0$
5. Let X~N(0,1), Obtain the characteristic function of X?
6. Let $X_1, X_2 - - X_n$ be random sample of size n from the Poisson distribution with parameter $\theta = 1$?

   Show that $\lim_{n \to \infty} e^{-n} \sum_{k=1}^{n} \frac{n^k}{k1} = 1$
7. Let p and q be real numbers such that $\frac{1}{p} + \frac{1}{q} = 1$? Show that $E(1 \times Y1) \leq (E1 \times 1^p)^{1/p}$

   $E(1 Y 1^q)^{1/q}$
8. State and prove Jenson's inequality?
9. Define probability space of a random experiment?
10. Find the characteristic function for $f(x) = Re^{-|x|}$; $-\infty < x < \infty$
11. Define convergence in probability & prove $X_n \xrightarrow{P} R \Rightarrow {}^{2}X_n \xrightarrow{P} R^2$
12. State Holder's inequality and its importance?
13. State and prove uniqueness theorem of characteristic function?

UTTER PRADESH RAJARSHI TANDON OPEN UNIVERSITY, PRAYAGRAJ

Assignment Session-2020-21

Course Code: PGSTAT-02/MASTAT-02 (NEW) PGSTAT-03/MASTAT-03 (OLD)	Course Title: Statistical Inference	Maximum Marks: 30

Section -A

Long Answer Questions

Note: Attempt any three questions. Each question should be answered in 800 to 1000 Words.

Maximum Marks: 18

1. State and prove Rao- Blackwell theorem?
2. State and prove Neyman - Fisher Factorization theorem?
3. State and prove Lehman- Scheffe theorem?
4. State and prove Cramer- Roo inequality?
5. State and prove Neyman- Pearson lemma?
6. On the basis of random sample of size n from the Poisson distribution with parameterθ, obtain UMVUE of $e^{-5\theta?}$

   (i) With the help of an example, show that a minimal sufficient statistic need not be complete?

   (ii) With the help of an example, show that a sufficient statistic need not be complete?
7. On the basis of a random sample of size n from the family of normal distributions $\{N[\theta,\theta], 0<\theta<\infty\}$, obtain a minimal sufficient statistic?
8. Derive Chapman Robbins Kiefer bound?
9. What do you mean by an unbiased estimator? It T is an unbiased estimator of Q, show that $\sqrt{T}$ and T^2 are the biased estimators of $\sqrt{Q}$, and Q^2, respectively?

10. What is sufficiency? Let X_1, X_2 be i,i,d? Poisson (Q) variates? Show that $(X_1 + 3X_2)$ is not sufficient for θ_1 but $(X_1 + X_2)$ is sufficient forθ?

11. Prove that the sampling from $N(\mu, \sigma^2)$ population , the sample mean is consistent estimator of μ?

12. Prove that, if T_1 and T_2 be two MVUE for a parameter , then $T_1 = T_{2?}$

13. Define MVU estimators? Also obtain the MVUE for μ in the normal population N (μ, σ^2), where σ^2 is known?

Section - B

Short Answer Questions

Note: Attempt any four questions. Answer should be given in 200 to 300 Words.

Maximum Marks: 12

1. Write short notes on (a) MP tests (b) UMP tests
2. Write short notes on (a) Power of test (b) Level of Significance
3. Discuss about the CRK bound?
4. Discuss in short (a) BAN estimator (b) CAN estimator
5. Discuss about the Bhattacharya bound?
6. Write down the general forms of one parameter exponential family of distributions? Give example of two continuous distributions which do not belong to one parameter exponential family of distributions?
7. On the basis of a random sample of size n from $N(0, \theta)$, obtain Cramer Rao lower bound for the variance of an unbiased estimator of $\sqrt{\theta}$?
8. On the basis of a random sample of size n from the Poisson distribution $P(\theta)$, obtain Cramer Rao lower bound for the variance of unbiased estimator of θ^2?
9. Define BAN and CAN estimators?

10. Prove that family of binomial distributions {B(n,p); $0<p<1$}, is complete?
11. Define exponential family of distributions?
12. Discuss about the confidence interval and confidence coefficient?
13. With the help of on example, show that the maximum likelihood estimator is not unique?

UTTER PRADESH RAJARSHI TANDON OPEN UNIVERSITY, PRAYAGRAJ

Assignment Session-2020-21

Course Code: PGSTAT-03/MASTAT-03 (NEW) PGSTAT-04/MASTAT-04 (OLD)	Course Title: Linear Models and Design of Experiments	Maximum Marks : 30

Section -A

Long Answer Questions

Note: Attempt any three questions. Each question should be answered in 800 to 1000 Words.

Maximum Marks: 18

1. State and prove Gauss-Markov theorem?
2. Define BIBD with its all Parameters?
3. Discuss about the analysis of covariance and ANCOVA table?
4. Discuss about the split plot design?
5. State and prove Markov theorem?
6. Give the complete analysis of Intra block Design?
7. Give the complete analysis of Inter block Design?
8. Write a detailed note on confounding in factorial experiments?
9. What is BIBD? How do construct a BIBD?
10. Discuss about the Resolvable and Affine Resolvable Design?
11. Write a note on Yates method of statistical analysis of 3^3 factorial experiment?
12. Describe all three fundamental principles of design of experiments?

Section - B

Short Answer Questions

Note: Attempt any four questions. Answer should be given in 200 to 300 Words.

Maximum Marks: 12

1. Give the different steps for the analysis of 2^3 factorial design?
2. Discuss about the partial confounding?
3. Define (a) BLUE (b) ANOVA
4. Discuss about the BIBD and its parameters?
5. What is Best linear unbiased estimate (BLUE)?
6. Discuss about Turkey's Test?
7. Discuss about the Construction of BIBD?
8. Write a note on Analysis of Two way classified data with its ANOVA table?
9. Write a note on Analysis of 2^3 factorial experiments with its ANOVA table?
10. Describe the process of testing a linear hypothesis in detail?
11. State and prove Tuckey's test?
12. Write a note on linear estimation?

UTTER PRADESH RAJARSHI TANDON OPEN UNIVERSITY, PRAYAGRAJ

Assignment Session-2020-21

Course Code: PGSTAT-04/MASTAT-04 (NEW) PGSTAT-05/MASTAT-05(OLD)	Course Title: Survey Sampling	Maximum Marks : 30

Section -A

Long Answer Questions

Note: Attempt any three questions. Each question should be answered in 800 to 1000 Words.

Maximum Marks: 18

1. Prove that
2. Discuss about the Midzuno and Narian system of sampling?
3. Write a note on Non Sampling and Sampling error?
4. Discuss about the Desraj ordered estimates?
5. Calculate mean and variance of ratio and regression sampling?
6. Discuss about the Midzuno & Narain system of sampling?
7. Define multi stage sampling?
8. Explain Desraj ordered estimates?
9. Write a comparison between cumulative total and lahiri's methods?
10. Compare cluster sampling with stratified sampling?
11. Differentiate between post stratification and deep stratification?
12. Show that the Desraj's strategy is superior to Hansen-Hurwitz strategy?

Section - B

Short Answer Questions

Note: Attempt any four questions. Answer should be given in 200 to 300 Words.

Maximum Marks: 12

1. Write short notes on duster sampling?
2. Discuss about the mean and variance of the SRSWOR?
3. Discuss in detail about the regression estimator?
4. Calculate mean and Variance of SRS WOR?
5. Prove that - $V(\bar{Y}_{sy}) \leq (\bar{Y}_{sy}) \leq (\bar{Y}_{SRS})$
6. Write a note on Two stage sampling?
7. Write a note on Cluster sampling?
8. Write a note on varying probability without replacement?
9. What is double sampling?
10. What do you understand by stratification?
11. Discuss about ratio and regression sampling?

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Assignment Session-2020-21

Course Code: PGSTAT-05/MASTAT-05(New) PGSTAT-08/MASTAT-08 (Old)	Course Title: Stochastic Process	Maximum Marks : 30

Section -A

Long Answer Questions

Note: Attempt any three questions. Each question should be answered in 800 to 1000 Words.

Maximum Marks: 18

1. What is stochastic process? What are the main elements distinguishing stochastic process?
2. For a two state Markov chain, under suitable assumptions, derive the expression for the probability that the process occupies state 1 at time n given that the initial probability vector is $(P_O\ P_1)$?
3. State and prove the Chapman Kolmogorov equation for a Markov Chain? Giving some counter example, show that the equations are satisfied by non-Markovian processes also?
4. Stating the underlying assumptions, give the derivation of a Poisson process?
5. Show that $\{x(\in),\ \in\geq 0\}$ is not a Poisson process $x(\in) = x_1(\in) - x_2(\in),\ \in\geq 0$, where $\{x_1(\in),\ \in\geq 0\}$ and $\{x_2(\in),\ \in\geq 0\}$ are independent Poisson process with mean rates υ_1 and υ_2 respectively?
5. Prove that in a Poisson Process the time between two successive events is a random variate with exponential distribution?
6. What are the postulates of Poisson process?
7. Obtain necessary and sufficient condition for state j of a Markov chain to be persistent?
8. What is Gambler's ruin problem? Give an example?

9. Distinguish between discrete and continuous state stochastic process with examples?
10. What do you mean by stationary and non stationary stochastic process?

Section - B

Short Answer Questions

Note: Attempt any four questions. Answer should be given in 200 to 300 Words.

Maximum Marks: 12

1. Define (i) An Ergodic Markov Chain, (ii) Stationary Markov Chain?
2. Find the probability distribution of inter arrival time for a Poisson process?
3. Let C_1 and C_2 be two communicative classes of a Markov chain and "S" be a state, which belongs to C_1 but not C_2? Prove that C_1 and C_2 are disjoint?
4. Prove that if a Poisson process has occurred once in time interval (O,a], then the point at which it occurs is distributed uniformly over interval (0,a]?
5. Define stationary probability distribution?
6. State limit theorems for ergodic chain?
7. Find out the probability generating function of a Simple Branching Process?
8. State in brief random week and gambler's win problem?
9. State (Do not give the proof) fundamental theorem of probability of extinction in Branching Process?
10. Give a classification of stochastic process with example?
11. Explain the concept of probability law of a stochastic process?

UTTER PRADESH RAJARSHI TANDON OPEN UNIVERSITY, PRAYAGRAJ

Assignment Session-2020-21

Course Code: PGSTAT-07/MASTAT-07 (NEW) PGSTAT-01/MASTAT-01 (OLD)	Course Title: Mathematical Analysis	Maximum Marks : 30

Section -A

Long Answer Questions

Note: Attempt any three questions. Each question should be answered in 800 to 1000 Words.

Maximum Marks: 18

1. What do you understand by functions of bounded variation?
2. State and prove Baire's theorem?
3. State and prove the necessary and sufficient conditions for a metric space to be compact?
4. Show that a sequentially compact subset of R is complete?
5. State & Prove Riemann Stieltjes integrals?
6. State and prove Reusz-Fischar theorem?
7. What do you understand by metric space and its completeness?
8. Show that a metric space S is connected iff every two valued function on S constant?
9. State and prove additive property of total variation?
10. State and prove sufficient conditions for convergence of Fourier series at a particular point?
11. Show that in any metric space, every compact subset is complete?
12. Show that a function of bounded variation is necessarily bounded?
13. Show that every real function of bounded variation on [a,b] is bounded, but converse is not necessarily true?

Section - B

Short Answer Questions

Note: Attempt any four questions. Answer should be given in 200 to 300 Words.

Maximum Marks: 12

1. Write short notes on (a) MP tests (b) UMP tests
2. What is the concept of total variation?
3. Discuss about the CRK bound?
4. Discuss in short (a) BAN estimator (b) CAN estimator
5. Discuss about the Bhattacharya bound?
6. Discuss about Open & closed sets?
7. Write a note on Continuity & Compactness?
8. Write a note on ternary cantor set?
9. Define compact spaces & compact sets?
10. Define completeness and compactness of metric spaces?
11. Define Fourier series?
12. Write a note on Convergence of the sequence?

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Assignment Session-2020-21

Course Code: PGSTAT-08/MASTAT-08 (NEW)	Course Title: Measure Theory	Maximum Marks : 30

Section -A

Long Answer Questions

Note: Attempt any three questions. Each question should be answered in 800 to 1000 Words.

Maximum Marks: 18

1. State and prove Heine-Borel theorem?
2. State and prove Fubini's theorem?
3. State and prove Radon- Nikodym theorem? Also mention its applications?
4. Define measure space (π, ξ)? Also, show that if it is a measure in (π, ξ)?
5. Show that if it is a measure on a σ - filled ξ of subsets of π and $\{E_n\}$ is a decreasing sequence of sets in ξ for which at least one has finite measure, then $\lim_{n} \mu(E_n) = \mu(\lim_{n} E_n)$?
6. State and prove uniqueness theorem?
7. State and prove Bolzano-Weirstrass theorem?
8. Discuss about the Lebesgue-Stielitjes measures and Lebesgue Stielitjes integral?
9. Discuss about the real valued functions and continuous functions?
10. Write a note on measures, outer measures, signed measures and measurable functions?
11. State and prove Monotone convergence theorem?
12. Define Hausdorff measure on the real line with at least two examples?

Section - B

Short Answer Questions

Note: Attempt any four questions. Answer should be given in 200 to 300 Words.

Maximum Marks: 12

1. Discuss about the Riemann- Stieltjer integrative?
2. Define about the Hahn & Jordan decomposition?
3. Discuss about the Leibnitz rule?
4. Write short notes on (a) Field (b) Signed Measure
5. Define Boral measurable function and it utility in statistics?
6. What do you mean by convergence in measure?
7. State and prove Fatou's lemma?
8. Discuss about the rule of maxima ana minima?
9. Define continuity and absolute continuity?
10. Write a note on product space and product measure?
11. Define convergence? Also define point wise convergence and uniform convergence?
12. Write a note on power series and radius of convergence?

UTTER PRADESH RAJARSHI TANDON OPEN UNIVERSITY, PRAYAGRAJ

Assignment Session-2020-21

Course Code: PGSTAT-09/MASTAT-09 (NEW)	Course Title: Survival Analysis	Maximum Marks : 30

Section -A

Long Answer Questions

Note: Attempt any three questions. Each question should be answered in 800 to 1000 Words.

Maximum Marks: 18

1. Calculate the moment generating function of exponential distribution?
2. Write a short note on Tarone- Ware tests and Deshpande test?
3. Discuss about the life tables? Also construct the life table?
4. What do you mean by censor real data? Also, differentiate it from truncated data (in detail)?
5. Define clinical trials? Write a detailed note on case-control study?
6. Write a detailed note on Cox model and its applications?
7. Calculate the Moment Generating Function of Gamma Distribution? Also find its mean and variance?
8. Discuss about the Cox's proportional Hazards model?
9. Define Bathtub Failure rate? Why the shape is in Bath tub?
10. Discuss about Actuarial estimator and Kalpan Meier Estimator?
11. Define Point Estimation and Interval Estimation?
12. Discuss about the abridged life table? Also describe the all components of this?

Section - B

Short Answer Questions

Note: Attempt any four questions. Answer should be given in 200 to 300 Words.

Maximum Marks: 12

1. Write short notes on Mantel Haenszel test & Log rank test?
2. Describe Weibull distribution with its first four moments?
3. What is Ageing Classes? Write its properties?
4. Write a note on Rank test for the regression coefficient?
5. Define survival function? Establish its relationship with hazard function?
6. What do you understand by ageing?
7. What do you mean by survival function?
8. Write a note on Pareto distribution with its mean and variance?
9. Write a note on Gehan test and rank test for regression coefficient?
10. Discuss about the log normal distribution with its mean and variance?
11. Write a note n 'Lack of Memory Property'?

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Assignment Session-2020-21

Course Code: PGSTAT-10/MASTAT-10 (NEW)	Course Title: Reliability Theory	Maximum Marks : 30

Section -A

Long Answer Questions

Note: Attempt any three questions. Each question should be answered in 800 to 1000 Words.

Maximum Marks: 18

1. Write a note on Hollander Proschan and DeshPande test for exponential?
2. State and prove Loss of memory property of exponential distribution?
3. Define reliability? Also, differentiate it from quality, clearly?
4. What are different measures of component reliability? State and prove their relationships?
5. Write note on various system configurations?
6. Discuss about the Cauchy distribution with its moment generating function?
7. Write a note on stress strength reliability and its estimation?
8. Discuss about the non homogeneous Poisson process for reliability Analysis?
9. Discuss about the reliability growth models and probability plot techniques?
10. Discuss about the Weibull distribution with its mean and variance?
11. Write a note on probability plotting techniques?
12. What is exponential life time model?
13. State and prove any two properties of exponential life time model?
14. Differentiate type-I and type-II censoring. Also find likelihood functions in both the cases?

Section - B

Short Answer Questions

Note: Attempt any four questions. Answer should be given in 200 to 300 Words.

Maximum Marks: 12

1. Define p-p plots with applications?
2. Discuss utility of cut and path sets?
3. State and Prove the additive property of the Gamma Variate?
4. Describe Reliability function and Hazard rote?
5. Discuss about the ageing?
6. Write short notes on (a) Expectation of life (b) Abridge life table
7. Write a note 'Lack of Memory Property'?
8. What do you mean by Coherent system?
9. Write a note on hazard rate and modular decomposition?
10. What is stress strength model? Give example?
11. Write a note on minimal cut sets and non homogeneous poison process?
12. What is accelerated life testing? Explain in detail?

UTTER PRADESH RAJARSHI TANDON OPEN UNIVERSITY, PRAYAGRAJ

Assignment Session-2020-21

Course Code: PGSTAT-11/MASTAT-11 (New)	Course Title: Operation Research	Maximum Marks : 30

Section -A

Long Answer Questions

Note: Attempt any three questions. Each question should be answered in 800 to 1000 Words.

Maximum Marks: 18

1. Discuss about the Linear Programming Also Define the different steps for Graphical solution to LPP?
2. Discuss about the principle of simplex method? Also define non basic variable and artificial variables?
3. Discuss about the different methods for the computation of an initial basic feasible solution?
4. Write a detailed not on classification of models used in operations research?
5. What is a game problem? How do we solve these problems using LPP technique? Give example?
6. What is a transportation problem? How could it be considered as LPP? Also, show that number of basic variables in a transportation problem of order m x n, are at the most m+ n -1
7. Explain the following terms?
   (i) Feasible solution (FS)
   (ii) Basic solution (BS)
   (iii) Basic feasible solution (BFS)

(iv) Optimum BFS

8. What do you mean by LPP? Discuss geometric properties of LPP?
9. State and prove Duality theorem?
10. Discuss about the waiting time distribution for m/m/1 Model?
11. State and prove Kutin Tucker theorem?
12. Show that the numbers of basic variables in a transportation problem are at the most (m+n-1)?
13. State and prove the theorem on the relationship between the feasible on the relationship between the feasible solutions of LPP and its dual?
14. State and prove the dominance property for game problem?
15. State and prove Kruskal's algorithm?
16. State and prove Dijkstra's algorithm?
17. Define Bellman's Principle of Optimality with one example?
18. Discuss about the Travelling Salesman Problem?
19. Write a short note on Project evaluation and review technique?
20. Discuss about the sensitivity analysis of linear programming?
21. State and prove the dominance property for game problems?

Section - B

Short Answer Questions

Note: Attempt any four questions. Answer should be given in 200 to 300 Words.

Maximum Marks: 12

1. What is a spanning tree? Write the steps involved in finding the minimum spanning tree in a network using Prim's Algorithm?
2. Explain the basic steps in CPM/PERT techniques?
3. What is game theory? What are the various types of games? Write the major limitations of game theory?
4. Briefly explain dual simplex method?

5. Discuss in short the n^{th} Job problem?
6. Write short notes on

   (a) CPM (b) PERT (c) MODI method
7. Define machine interference problem?
8. Discuss about the replacement problem?
9. Write a note on staffing problem?
10. Define the problem of cycling in degeneracy?
11. Discuss in brief about the Hungarian method?
12. Discuss about the basic assumption of two person sum- zero game?
13. Write a note on pay off matrix?
14. State and prove little's theorem?
15. Describe the graphical method for or games?
16. What is a dual problem? How do we get a dual of given primal?
17. State and prove reduction theorem for assignment problems?
18. Write a brief note on phases of OR problem?
19. Give the basic assumptions of Two-Person Sum-Zero Game?
20. Write a brief note a various types of variables used in LPP?
21. Differentiate clearly between primal and its dual problem (with example)?

UTTER PRADESH RAJARSHI TANDON OPEN UNIVERSITY, PRAYAGRAJ

Assignment Session-2020-21

Course Code: PGSTAT-12/MASTAT-12 (New)	Course Title: Linear Algebra	Maximum Marks : 30

Section -A

Long Answer Questions

Note: Attempt any three questions. Each question should be answered in 800 to 1000 Words.

Maximum Marks: 18

1. State and Prove basis extension theorem for a finite dimensional vector space V over the field F?
2. State and Prove Cayley-Hamilton theorem?
3. Let f be the bilinear form on R^3 defined by

   $F\{(x_1,x_2,x_3), (y_1,y_2,y_3)\} = 3x_1y_1 - 2x_1y_2 + 5x_2y_1 + 7x_2y_2 - 8x_2y_3 + 4x_3y_2 - x_3y_3$?

   Find matrices of f in the bases

(i) {(1,0,0), (0,1,0), (0,0,1)}

(i) {(1,1,0), (1,0,1), (0,0,1)} also verify that they are congruent?

4. If V is a finite dimensional vector space and $T : V \to V^1$ is a linear map, then prove that Lim V = rank T + nullity T
5. Find all eign values and eign vectors of a linear transformation $T : IR^3 \to IR^3$, defined as T (x, y, z) = (2x + y, y-z, 2y + 4z). Is T diagonalizable?
6. Define the norm of a vector in an inner product space. If a and b are two linearly independent vectors of an inner product space (V, < >), then prove that

   $$| <a, b> | < || a || || b ||.$$

7. If w_1 and w_2 are any two finite subspaces of a vector space V then show that

dim $(w_1 + w_2)$ = dim w_1 + dim w_2 – dim $(w_1\ w_2)$

8. For two square matrices A and B show that
   (a) trace (A+B) = trace A + trace B
   (b) trace (AB) = (trace BA)

9. State and prove Bessel's inequality in and Inner product space.

10. Find the eigen Values and eigen vectors of the matrix A=

11. Let f be a bilinear form of IR^2 defined as f *3 1 2+ 2 2*then find a *11,0 (1,1) 22,1* matrix P with respect to B_1 and B_2.

Section - B

Short Answer Questions

Note: Attempt any four questions. Answer should be given in 200 to 300 Words.

Maximum Marks: 12

1. Show that $(Z_1 \times Z_2, +i)$ is a vector space over Z_2?
2. If V is a finite dimensional vector space, then prove that $T^t(B)$ is a subspace of V where T : V $\rightarrow$V is a linear transformation and B is a subspace of V? Also prove that dim $(T^t(B))$ is not less than the nullity T?
3. Let A and B be mxn matrices over a field F then prove that
   (i) $(A+B)^t = A^t+B^t$ (ii) $(AB)^t = B^t?A^t$where A^t is transfer of A?
4. Prove that the characteristics roots of a complex hermitian matrix are all real.
5. If a map T : IR2 $\rightarrow$ IR3 be defined by T (x, y) = (x + y, x - y, y) is linear, find rank and nullity of T.
6. A function f is defined on IR2 as follows: f (x, y) = (x1 - y1)2 + x1 y2 ,
   Where x = (x1 - x2) and y = (y1 , y2), Is f a bilinear form? Verify.
7. Let V be a vector space over a field F such that it has no proper subspace. Then show

that either V = { o } or dim V = 1.

8. Show that the characteristic roots of matrix B and matrix p^{-1} B P are same.

9. Which of the following is a linear transformation where T : IR^2 IR^2

(a) T $(x_1, x_2) = (1+ x_1, x_2)$ (b) T $(x_1, x_2) = (x_2, x_1)$

10. Prove that a linear transformation on vector space is diagonalizable if the eigen values of the transformation are as much equal as the dimension of vector space.

11. If F is a vector space of column vectors and A be a square matrix of order n then show that f : F F F where f (X,Y) = X^t AY is a bilinear form on vector space.

12. Prove that eigen values of similar matrices are similar.

13. Define Symmetric difference of two sets. Show that a symmetric difference is as associative.

14. Let be a map. Let A c X, B c X then show that C

15. Define inner product space with an example.

UTTER PRADESH RAJARSHI TANDON OPEN UNIVERSITY, PRAYAGRAJ

Assignment Session-2020-21

Course Code: PGSTAT-13/MASTAT-13(New) PGSTAT-09/MASTAT-09 (Old)	Course Title: Decision Theory	Maximum Marks : 30

Section -A

Long Answer Questions

Note: Attempt any three questions. Each question should be answered in 800 to 1000 Words.

Maximum Marks: 18

1. What is the equalizer rule? Discuss about it? Give an example of an equalizer rule?
2. State and Prove Minimax Theorem?
3. Discuss about the Optimal Decision Rules?
4. What is admissibility criterion for a decision rule? Explain with example?
5. State and Prove complete class Theorem?
6. What is optional decision rule? Illustrate through an example?
7. Discuss about the loss function? Also define the different types of loss functions?
8. Clearly differentiate between decision space and the action space?
9. State is the basic difference between Bayes and Minimax Principles?
10. Define complete class of decision rules? How does it become minimal complete?
11. Let x ~p(θ) and o ~ G(α,β)? Obtain Bayes estimation of unknown parameter θ under the loss function? L (θ, a)= $(\theta - a)^2$
12. Let X_1, X_2 …… X_n be a random sample of size n, n from the G(α, β) distribution, with α known and β unknown? Find the best invariant estimator of β for the loss function?

$$L(B, a) = \left(1 - \frac{a}{\beta}\right)^2$$

13. With the help of an example, show that generalized Bayes rules need not be admissible?
14. Obtain the new distribution, when population multiple correlation coefficient is zero?
15. Let $X \approx \cap\cup N(\theta, 1)$ and $\theta \cap\cup N(0, 1)$? Obtain Bayes estimate of θ under the loss function?

$$L(\theta, a) = e^{(3\theta^{2/4})}(\theta - a)^2$$

Section - B

Short Answer Questions

Note: Attempt any four questions. Answer should be given in 200 to 300 Words.

Maximum Marks: 12

1. Discuss about the Invariance and ordering?
2. Write a note on basic elements of decision theory?
3. Write a note on Extended Bayes Rule?
4. Write short notes on (a) Admissibility (b) Completeness
5. What is the criterion of optimal decision rule?
6. Write a note on supporting hyper plane theorem?
7. Give the difference between Baye rule and extended Bayes rule?
8. Write a note on separating hyper plane theorem?
9. What is Minimal Complete class? Illustrate through an example?
10. State and explain Minimax theorem?
11. Describe Multiple Decision problem with example?
12. Define invariant decision rule?
13. Give examples of (i) an improper prior distribution and (ii) a proper prior distribution?
14. What is risk? How is it different from loss?
15. Define minimal complete class?
16. Write a note on equalizer rules with some examples?

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Assignment Session-2020-21

Course Code: PGSTAT-14/MASTAT-14 (New) PGSTAT-10/MASTAT-10 (Old)	Course Title: Multivariate Analysis	Maximum Marks : 30

Section -A

Long Answer Questions

Note: Attempt any three questions. Each question should be answered in 800 to 1000 Words.

Maximum Marks: 18

1. What is multivariate normal distribution (MND)? Estimate the moment generation function of MMD?
2. Discuss about the Wishart distribution? Also Calculate the characteristic function of Wishart distribution?
3. Calculate the maximum likelihood estimator of mean vector?
4. Define multivariate normal distribution with its properties? Also, show that when x is normally distributed the components are mutually independent if the covariance matrix is diagonal?
5. Write a detailed note on without distribution? Show that if $M \sim W(p,m,\Sigma)$ then diagonal submatrics of M themselves have a Wishart distribution?
6. What is T^2 statistic? Discuss its relationship with other distribution (with proof)?
7. Discuss about the Hoteing's T^2 distribution and its applications?
8. Explain Mahalanobis D^2 distribution and its various applications?
9. Discuss about the multiple and partial correlation coefficient of MND?
10. Calculate the marginal and conditional distributions of MND?
11. Define the new distribution when population multiple correlation coefficient is zero?
12. Distinguish the difference between multivariate normal distribution and simple normal distribution?

Section - B

Short Answer Questions

Note: Attempt any four questions. Answer should be given in 200 to 300 Words.

Maximum Marks: 12

1. Estimate the characteristic function of MMD?
2. Describe about the multiple and partial correlation coefficient of MND?
3. Write short notes on Discriminate Analysis?
4. Obtain MLE of mean vector for multivariate normal population?
5. Prove additive property of wishart distribution?
6. Define the concept of Mahalanobis distance with example? Also discuss its applications?
7. Write a detailed note on Wishart Distribution?
8. Calculate the characteristic function of MND?
9. Estimate the Maximum likelihood estimates of mean vector of MND?
10. Discuss about the least favorable distribution?
11. Write a note on unbiasedness and admissibility?
12. Estimate the additive property of MND?
13. Define the covariance matrix of MND?

UTTER PRADESH RAJARSHI TANDON OPEN UNIVERSITY, PRAYAGRAJ

Assignment Session-2020-21

Course Code: PGSTAT-15/MASTAT-15(New) PGSTAT-11/MASTAT-11 (Old)	Course Title: Nonparametrics	Maximum Marks : 30

Section -A

Long Answer Questions

Note: Attempt any three questions. Each question should be answered in 800 to 1000 Words.

Maximum Marks: 18

1. State and prove Kolnogorov Smirnov two sample test?
2. State and prove Kolnogorov Smirnov one sample test?
3. Discuss about the Mann-Wliteney U-test with its applications?
4. What do you understand by order statistics? Discuss their role in non-parametric theory?
5. Obtain the joint distribution of maximum and minimum order statistics?
6. What do you mean by two sample location test? Discuss sign test for two sample problem?
7. What is U statistics? Obtain its distribution?
8. Discuss the meaning and importance of order statistics?
9. Derive the distribution of r^{th} order statistics? And hence, obtain the distribution of minimum and maximum order statistics?
10. Write a detailed note on distribution free tolerance interval?
11. Discuss about Fooleries limits?
12. Derive the approximate expressions for SPRT of simple hypothesis against a simple alternative?
13. Discuss about the Distribution free confidence interval for quantiles? Are the confidence intervals for quantiles distribution free?

Section - B

Short Answer Questions

Note: Attempt any four questions. Answer should be given in 200 to 300 Words.

Maximum Marks: 12

1. Write short notes on two sample location tests?
2. Discuss in short about the Median test and Wilcoxan test?
3. Write short notes on Run test and Sign test?
4. Discuss about the Pitman ARE?
5. Write a note on merits and demerits of non-parametric tests?
6. Show that for any absolutely continuous distribution Kolmogorov - Smirnov statistic is distribution free?
7. Prove that the expected area between any two consecutive order statistics is $\frac{1}{(n+1)}$?
8. Derive the joint distribution of r^{th} and s^{th} order statistics?
9. Discuss the merits and demerits of non-parametric tests?
10. Write a brief note on location based tests?
11. Write a note on OC and ASN functions of sequential analysis?
12. What do you mean by runs? Discuss the run test?

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Assignment Session-2020-21

Course Code: PGSTAT-16/MASTAT-16(New) PGSTAT-12/MASTAT-12 (Old)	Course Title: Econometrics	Maximum Marks : 30

Section -A

Long Answer Questions

Note: Attempt any three questions. Each question should be answered in 800 to 1000 Words.

Maximum Marks: 18

1. Define linear regression model with assumptions?
2. Discuss about the SURE model and its estimation?
3. What is Dummy Variable? Discuss about the use of Dummy Variables?
4. Define econometrics? What is its limitation?
5. Write a detailed note on "Problem of Identification"?
6. Define Mahalanobis model with applications?
7. What do you mean by indirect least estimators?
8. Write a note on point and interval predictors?
9. Write a note on method of two stage least square?
10. Write a note on non-spherical disturbances?
11. What are simultaneous equation models? Discuss their role in econometrics?
12. For the model given in question number 1, consider the set of linear hypotheses about $\underline{\beta}$ given by Ho : $R\underline{\beta} = \underline{r}$, R being a known matrix of order $\underline{a} \times p$ with $\underline{a} \leq p$ and $\underline{r}$ is a $\delta \times 1$ vector? Write down form of R and $\underline{r}$ for hypotheses as under : 6

    (i) Ho : $\beta_3 = 0$

    (ii) $\beta_4 + \beta_5 = 2$

13. Consider the linear model as given in question number? Describe the procedure for obtaining confidence interval for βi, the i-th component of $\underline{\beta}$?

Section - B

Short Answer Questions

Note: Attempt any four questions. Answer should be given in 200 to 300 Words.

Maximum Marks: 12

1. Discuss about the maximum likelihood method for estimation of the parameters?
2. What are the indirect least square estimators also define about two stage least square estimators?
3. Discuss about the Point and interval Predictors?
4. Write shout notes on R^2 an adjusted R^2
5. What is multicollinearity?
6. Discuss Durbin-Watson test?
7. State and prove Gauss Markov theorem?
8. Describe dummy variable?
9. What do you mean by spherical disturbance?
10. Write down expression for R^2?
11. Write down structural form of a model?
12. Discuss the inconsistency of OLS estimators?
13. What is over sufficiency of information? Explain with example?
14. Define limited information estimators?

UTTER PRADESH RAJARSHI TANDON OPEN UNIVERSITY, PRAYAGRAJ

Assignment Session-2020-21

Course Code: PGSTAT-17/MASTAT-17(New) PGSTAT-13/MASTAT-13 (Old)	Course Title: Demography	Maximum Marks : 30

Section -A

Long Answer Questions

Note: Attempt any three questions. Each question should be answered in 800 to 1000 Words.

Maximum Marks: 18

1. Write a note on stable and Stationary population theory?
2. Discuss about the migration with its type and deferent methods of estimation?
3. Discuss about the migration with its type and deferent methods of estimation?
4. Discuss about the steps of construction of abridge life table.
5. Discuss about the life time survival ratio method and census survival method?
6. Describe the structure of abridge life table?
7. Define GRR and NRR? Prove that NRR $\leq$ GRR? Give the reason, why NRR is less than GRR?
8. Discuss about the migration? Also define estimation of internal migration from duration of residence statistics?
9. Discuss about the Brass P/F ratio for adjusting fertility rates?
10. Describe the various components of a life table? How is the expectation of life at birth determined from a life table?
11. Define and compare the various measures of fertility?
12. Define and compare the various measures of mortality?

13. Write a note on stable and stationary population theory?
14. Describe the various components of a life table? How is the expectation of life at birth determined from a life table?
15. Discuss about the Keyfitz Method of construction of life table?
16. Discuss in detail Greville's Method of construction an abridge life table?
17. Discuss about the any two methods for measurement of internal migration?
18. Calculate the mean length of generation in stable population?
19. Estimate the mean age of the stable population?
20. Give the all steps of construction of Net Nuptiality Table?
21. Discuss about the birth Poisson process?
22. Discuss about the death Poisson process?
23. Write a note on population projection?

Section - B

Short Answer Questions

Note: Attempt any four questions. Answer should be given in 200 to 300 Words.

Maximum Marks: 12

1. Write shout notes on (a) NRR (b) GRR
2. Write shout notes on (a) ASFR (b) TFR
3. Write shout notes on (a) CEB (b) Brass PIF ratio
4. Write shout notes on (a) Mean Length of Generation (b) Expectation of life
5. Discuss about the In-migration & immigration?
6. Define Basic concept of stable and stationary population?
7. Discuss about the IMR (Infant mortality rate) and CEB (Children ever Born)?
8. Write a note on Intrinsic birth rate and intrinsic death rate?
9. Write a note on Intrinsic rate of natural increase and mean length of generation?
10. Define birth intervals? Also discus about types of birth intervals?
11. Write short notes on TFR and CBE?
12. Write a note on CDR and STDR?

13. Discuss about Stable Population and Stationary Population
14. Write a note on Mean length of generation and intrinsic rate of natural increase?
15. Discuss about Lee's theory of migration?
16. Discuss about the LFR model of development theory?
17. Write Ravenstein's laws of migration?
18. Discuss about the expectation of life and survival ratio?
19. Write a note on birth intervals? Also define types of birth intervals?
20. Write a note on straddling birth interval?
21. Discuss about the Coale's model for age pattern of fertility?
22. Write a note on fecundity and fecundability?
23. Discuss about the PPR (parity progression ratio)?
24. Find TFR through Boongaart's model with all notations?
25. Write a note on the estimation of mean age at widowhood?

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Assignment Session-2020-21

Course Code: PGSTAT-20/MASTAT-20 (New)	Course Title: Research Methodology in Social Behavior Sciences	Maximum Marks: 30

Section -A

Long Answer Questions

Note: Attempt any three questions. Each question should be answered in 800 to 1000 Words.

Maximum Marks: 18

1. What is Research? Also discuss the types of research?
2. Discuss about the Different methods of data Collection?
3. What is scaling? What are the different types of scales?
4. What do you understand by report writing?
5. Discuss about the attributes and also write a note on association of attributes?
6. Write a note on Analysis of Covariance?
7. Discuss about the Non Sampling Errors?
8. Discuss about the Different methods of data Collection?
9. Define sampling? Also write a note on the types of sampling procedures?
10. Distinguish between Research methods and Research methodology?
11. What is research problem? Give the Criteria of a good research problem? Also define the techniques?
12. Explain the meaning and significance of a research design?
13. Write a note on
    a. Likert-type scale b. Arbitrary scales
14. Write in detail about
    a. Criteria of Good Research b. Research and Scientific Methods

Section - B

Short Answer Questions

Note: Attempt any four questions. Answer should be given in 200 to 300 Words.

Maximum Marks: 12

1. Define (a) Critical Region (b) Level of Significance?
2. Write shout notes on (a) Types of Error (b) Types of Hypothesis
3. Write the basic principles of Experimental design?
4. Discuss about the different methods for collecting the sample under simple random sampling?
5. Distinguish the Difference Between multistage Sampling and two phase Sampling?
6. Discuss about the Measures of Sampling Errors?
7. Discuss about the sources of non response errors?
8. Discuss about the selection methods of Simple Random Sampling?
9. What is the difference between multiple bar diagram and divided bar diagram?
10. Discuss about the Pie Chart and Pictogram?
11. Define (a) Critical Region (b) Level of Significance
12. Write a note on multivariate analysis and factor analysis?
13. Write a note on multicollinearity?
14. Discuss about the discriminante analysis?

UTTER PRADESH RAJARSHI TANDON OPEN UNIVERSITY, PRAYAGRAJ

Assignment Session-2020-21

Course Code: PGSTAT-21/MASTAT-21 (New)	Course Title: Statistical Software	Maximum Marks: 30

Section -A

Long Answer Questions

Note: Attempt any three questions. Each question should be answered in 800 to 1000 Words.

Maximum Marks: 18

1. Discuss about the command based Statistical software packages?
2. What are R data frame? How is it different from a matrix?
3. Discuss about the window based Statistical software packages?
4. Discuss about the historical evaluation of computers?
5. Give the list of hardware's name and also give the various name of statistical software?
6. Describe the procedure for fixing width of variable in SPSS?
7. If the population of shell length to width ratios of a species of bivalve is normally distributed with a mean of 1.65 and a standard deviation of 0.05, what is the probability that any one shell picked at random has a length-to-width ratio : (i) less than 1.65 (ii) within two standard deviations of the mean.
8. Write a MATLAB function to calculate the maximum of ten numbers.
9. For a two state Markov chain, under suitable assumptions, derive the expression for the probability that the process occupies state 1 at time n given that the initial probability vector is $(P_O\ P_1)$.
10. State and prove the Chapman - Kolmogorov equation for a Markov Chain. Giving some counter example, show that the equations are satisfied by non-Markovian processes also.
11. Stating the underlying assumptions, give the derivation of a Poisson process.
12. Give step wise analysis of k-means cluster in SPSS?

13. Briefly explain the use of the following commands in MATLAB:

    a. grid ( )
    b. plot ( )
    c. title ( )
    d. print()
    e. x lable ()
    f. axis ()

Section - B

Short Answer Questions

Note: Attempt any four questions. Answer should be given in 200 to 300 Words.

Maximum Marks: 12

1. What is an R data frame? How is it different from a matrix?
2. Write the steps for doing the following in R:
   a) To create a data frame.
   b) Access specific rows and columns of a data frame.
3. Explain the use of Ms-Excel for statistical data Analysis.
4. Write a note on syntax based softwares?
5. How R commander is different form R?
6. Give the steps to define the variable in MS-Excel. How to calculate the mean using Ms-Excel?
7. Write down the steps to plot the Histogram by using SPSS and Excel. Also define about the Histogram.
8. Write short notes on SPSS. Also define the Data view and variable view.
9. Define (i) An Ergodic Markov Chain, (ii) Stationary Markov Chain.
10. Find the probability distribution of inter arrival time for a poisson process.
11. Let C_1 and C_2 be two communicative classes of a Markov chain and "S" be a state, which belongs to C_1 but not C_2. Prove that C_1 and C_2 are disjoint.
12. Prove that if a Poisson process has occurred once in time interval (O,a], then the point at which it occurs is distributed uniformly over interval (0,a].

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Assignment Session-2020-21

Course Code: PGSTAT-22/MASTAT-22 (New)	Course Title: Official Statistics	Maximum Marks: 30

Section - A

Long Answer Questions

Note: Attempt any three questions. Each question should be answered in 800 to 1000 Words.

Maximum Marks: 18

1. Discuss about the use of statistics in different fields.
2. Define census and birth & death registration system.
3. Write short notes on stable population and stationary population.
4. Discuss about the various optical agencies responsible for data Collection.
5. Discuss about the methods of Collection of data.
6. Discuss about the use of Statistics in day to day life.
7. Write an essay on the cost of living index number in India.
8. What is meant family budget survey?
9. Write a detailed note on components of time series.
10. What do you meant by SQC. Discuss briefly its need and utility in industries.
11. How can we use the principles of design of experiments in the field of Agriculture? And also discuss its benefits.

Section - B

Short Answer Questions

Note: Attempt any four questions. Answer should be given in 200 to 300 Words

Maximum Marks: 12

1. Discuss about the GRR and NRR.
2. Discuss about the principle of local control and randomization.
3. Write short notes on (a) Critical Region (b) Types of error
4. Discuss about the Hypothesis. Also give its types.
5. Describe, How Statistics is useful in the field of Agriculture.
6. Write some limitations of the data Collection methods.
7. What is Census.
8. Define level of significance and power of test.
9. Distinguish between rates and ratio.
10. Define migration how can its effects the population of any area.
11. Discuss about the IMR and MMR.