

उत्तर प्रदेश राजर्षि टण्डन मुक्त विश्वविद्यालय, प्रयागराज
सांख्यिकी (परास्नातक) कार्यक्रम अधिन्यास सत्र 2022 – 23

Course Code: PGSTAT-101)/MASTAT-101	Course Title: Measure and Probability Theory	Maximum Marks : 30
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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 Cauchy Schwartz inequality.
2. 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, $0 \leq P(A) \leq 1$
3. Discuss WLLN. How is it different from SLLN and CLT?

Section - B

Short Answer Questions

Maximum Marks: 12

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

1. Discuss about the Zero one law.
2. State Holder's inequality and its importance.
3. Let $\{X_n\}$ be a strictly decreasing sequence of random variables which assume positive values only and suppose that $X_n \xrightarrow{a.s.} 0$
4. State and prove Jensen's inequality.

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Course Code: PGSTAT-102/MASTAT-102	Course Title: Statistical Inference	Maximum Marks : 30
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Section- A
Long Answer Questions

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

Maximum Marks: 18

1. State and prove Neyman- Pearson lemma.
2. With the help of an example, show that a sufficient statistic need not be complete.
3. State and prove Lehman Schaffer theorem.

Section - B

Short Answer Questions

Note: Answer all questions. Answer should be given in 200 to 300 Words.

Maximum Marks: 12

1. Define exponential family of distributions.
2. 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 $\sqrt{\theta}$.
3. 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 .
4. State and prove Zehna theorem.

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Course Code: PGSTAT-103/MASTAT-103	Course Title: Survey Sampling	Maximum Marks : 30
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Section- A
Long Answer Questions

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

Maximum Marks: 18

1. Prove that $V(\bar{y}_{sy}) \leq V(\bar{y}_{st}) \leq V(\bar{y}_{srs})$
2. Write a note on Non Sampling and Sampling error.
3. Calculate mean and variance of systematic sampling.

Section - B
Short Answer Questions

Note: Answer all questions. Answer should be given in 200 to 300 Words.

Maximum Marks: 12

1. Define finite population correction factor.
2. Discuss about the advantages and limitations of stratified sampling.
3. Define multi stage sampling.
4. Discuss about the Desraj ordered estimates.

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Course Code: PGSTAT-105/MASTAT-105	Course Title: Linear Models and Design of Experiments	Maximum Marks : 30
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Section- A
Long Answer Questions

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

Maximum Marks: 18

1. Discuss in detail about the Analysis of Covariance.
2. Discuss about the 2^3 factorial experiments and give its ANOVA.
3. Write short notes on Split Plot design with its analysis.

Section - B
Short Answer Questions

Note: Answer all questions. Answer should be given in 200 to 300 Words.

Maximum Marks: 12

1. Write a brief note on BLUE
2. Write a note on contrast and orthogonal contrast.
3. Write a note on resolvable design and affine resolvable design.
4. Write a note on Parameters of BIBD. Also prove that $vr = bk$

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Course Code: PGSTAT-106/MASTAT-106	Course Title: Nonparametric	Maximum Marks : 30
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Section- A
Long Answer Questions

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

Maximum Marks: 18

1. Discuss about the order statistics.
2. Describe two Sample Kolmogorov Smirnov test.
3. Discuss about the Mann-Whitney V-test.

Section - B
Short Answer Questions

Note: Answer all questions. Answer should be given in 200 to 300 Words.

Maximum Marks: 12

1. Discuss in short about the Median test and Wilcoxon test.
2. Write short notes on (a) Run test (b) Sign test.
3. Discuss about the Pitman ARE.
4. Discuss the merits and demerits of non-parametric tests.

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Course Code: PGSTAT-107/MASTAT-107	Course Title: Stochastic Process	Maximum Marks : 30
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Section- A
Long Answer Questions

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

Maximum Marks: 18

1. 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.
2. Stating the underlying assumptions, give the derivation of a Poisson process.
3. Describe the state space and and there one step and two step marunon probability matness for the homogenous markov chain $\{x_n\}$.

Section - B

Short Answer Questions

Note: Answer all 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 interarrival time for a Poisson process.
3. Find out the probability generating function of a Simple Branching Process.
4. State in brief random walk and gambler's win problem.

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Course Code: <i>PGSTAT-109/MASTAT-109</i>	Course Title: <i>Decision Theory & Bayesian Analysis</i>	Maximum Marks : <i>30</i>
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Section- A
Long Answer Questions

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

Maximum Marks: 18

1. State and Prove Minimax Theorem.
2. State and Prove complete class Theorem.
3. State the basic difference between Bayes and Minimax Principles.

Section - B
Short Answer Questions

Note: Answer all questions. Answer should be given in 200 to 300 Words.

Maximum Marks: 12

1. Discuss about the Invariance and ordering.
2. Write short notes on (a) Admissibility (b) Completeness
3. Define extended Bayes rule.
4. Give examples of (i) an improper prior distribution and (ii) a proper prior distribution.

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Course Code: PGSTAT-110/MASTAT-110	Course Title: Multivariate Analysis	Maximum Marks : 30
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Section- A
Long Answer Questions

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

Maximum Marks: 18

1. Discuss about the Wishart distribution. Also find its additive Property.
2. Discuss about the Mahalanobis D^2 with its various applications.
3. Discuss about the Hotelling's T^2 distribution and its applications.

Section - B
Short Answer Questions

Note: Answer all questions. Answer should be given in 200 to 300 Words.

Maximum Marks: 12

1. Find the characteristic function of MMD.
2. Describe about the multiple and partial short.
3. Write short notes on Discriminate Analysis.
4. Maximum likelihood estimates of mean vector.

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Course Code: PGSTAT-111/MASTAT-111	Course Title: Econometrics	Maximum Marks : 30
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Section- A
Long Answer Questions

Note: Attempt all 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.

Section - B
Short Answer Questions

Note: Answer all questions. Answer should be given in 200 to 300 Words.

Maximum Marks: 12

1. What is multi co-linearity?
2. Discuss Durbin-Watson test.
3. State and prove Gauss Markov theorem.
4. What do you mean by spherical disturbance?

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Course Code: PGSTAT-113/MASTAT-113	Course Title: Demography	Maximum Marks : 30
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Section- A
Long Answer Questions

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

Maximum Marks: 18

1. Discuss about the steps of construction of abridge life table Also define abridge life table.
2. Define GRR and NRR. Prove that $NRR \leq GRR$. Give the reason why NRR is less than GRR.
3. Discuss about the migration. Also define estimation of internal migration from duration of residence statistics.

Section - B

Short Answer Questions

Note: Answer all questions. Answer should be given in 200 to 300 Words.

Maximum Marks: 12

1. Write short notes on (a) Mean Length of Generation (b) Expectation of life
2. Basic concept of stable and stationary population.
3. Intrinsic rate of natural increase and mean length of generation.
4. Discuss about types of birth intervals.
5. Mean length of generation and intrinsic rate of natural increase.

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Course Code: PGSTAT-114/MASTAT-114	Course Title: Survival Analysis & Reliability Theory	Maximum Marks : 30
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Section- A
Long Answer Questions

Note: Attempt all 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 Desh Pande test.
3. Discuss about the life tables. Also construct the life table.

Section - B

Short Answer Questions

Note: Answer all questions. Answer should be given in 200 to 300 Words.

Maximum Marks: 12

1. Write short notes on Mentel Haenzel test & Log rank test.
2. Describe Weibull distribution with its first four moments.
3. What is Ageing Classes. Write its properties.
4. Define survival function. Establish its relationship with hazard function.

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<i>Course Code:</i> PGSTAT-115/MASTAT -115	<i>Course Title :</i> Actuarial Statistics	<i>Maximum Marks : 30</i>
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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 principle of compound interest.
2. Discuss about life table and its relation with survival function.
3. Write a note on insurance and utility theory.

Section - B
Short Answer Questions

Maximum Marks: 12

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

1. Write a note on accumulation.
2. Discuss about the life annuities.
3. Discuss about the survival function.
4. Define survivor ratio.

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Course Code: PGSTAT-116/ MASTAT -116	Course Title : Operation Research	Maximum Marks : 30
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Section - A

Long Answer Questions

Note: Attempt any three questions. Each question should be answered in 800 to 1000 Words.
Maximum Marks: 18

4. Discuss about the principle of simplex method. Also define non basic variable and artificial variables.
5. What is a game problem? How do we solve these problems using LPP technique? Give example.
6. What do you mean by LPP? Discuss geometric properties of LPP.

Section - B

Short Answer Questions

Maximum Marks: 12

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

5. Discuss in brief about the Hungarian method.
6. What is a dual problem? How do we get a dual of given primal?
7. State and prove reduction theorem for assignment problems.
8. Give the basic assumptions of Two-Person Sum-Zero Game.

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Course Code: PGSTAT-117/MASTAT-117	Course Title: Mathematical & Real Analysis	Maximum Marks : 30
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Section- A
Long Answer Questions

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

Maximum Marks: 18

1. Discuss about the Riemann Stieltjes integrals.
2. Write a note on Convergence of the sequence.
3. State and prove Baire's theorem.

Section - B

Short Answer Questions

Note: Answer all questions. Answer should be given in 200 to 300 Words.

Maximum Marks: 12

1. Define about the Hahn & Jordan decomposition.
2. Discuss in short (a) BAN estimator (b) CAN estimator
3. State and prove Fubini's theorem.
4. Discuss about the Fouries Series.