उत्तर प्रदेश राजर्षि टण्डन मुक्त विश्वविद्यालय,प्रयागराज

सांख्यिकी (परास्नातक) कार्यक्रम अधिन्यास सत्र 2019—20

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

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 central limit theorem.

2. Write down the axiomatic definition of probability. Let A, B and C be three events.

3. Define characteristic function of random variable. State some of its important properties.

Section - B

Short Answer Questions

Maximum Marks: 12

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

1. State and prove Jensen inequality.

2. Discuss about the random variable and its type.

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 Jenson's inequality.

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Course Code: *PGSTAT-02(N)/MASTAT-02(N)* *PGSTAT-03(O)/MASTAT-03(O)*	*Course Title:* *Statistical Inference*	*Maximum Marks : 30*

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 Rao- Blackwell theorem.

2.   On the basis of random sample of size n from the Poisson distribution with parameter θ, obtain UMVUE of $e^{-5\theta}$.

3.   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.

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) MP tests (b) UMP tests.

2.   Let $X_1, X_2 - - X_n$ be a random sample from U $[0, \theta]$, $\theta \in (0,\infty)$. Let $X_{(n)} = $ Max $(X_1,X_2 - - X_n)$ Show that $X_{(n)}$ is not BAN for θ.

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.   Define the all conditions of a good estimator.

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

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 Gauss-Markov theorem.

2. Discuss about the analysis of covariance and define ANCOVA table.

3. Discuss about the Principles of design of experiment.

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-04(N)/MASTAT-04(N)* *PGSTAT-05(O)/MASTAT-05(O)*	*Course Title:* *Survey Sampling*	*Maximum Marks : 30*

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. Discuss about the Midzuno and Narian system of sampling.

3. Calculate mean and variance of ratio and regression sampling.

Section - B

Short Answer Questions

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

Maximum Marks: 12

1. Define Parameter and Statistic.

2. Discuss about the advantages and limitations of simple random sampling.

3. Write a note on Non Sampling and Sampling error.

4. Calculate mean and variance of the SRSWOR.

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Course Code: *PGSTAT-05(N)/MASTAT-05(N)* *PGSTAT-08(O)/MASTAT-08(O)*	*Course Title:* *Stochastic Process*	*Maximum Marks : 30*

Section- A
Long Answer Questions

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

Maximum Marks: 18

1. 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 $(P_O \ P_1)$.

2. 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.

3. Stating the underlying assumptions, give the derivation of a Poisson process.

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 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. State (Do not give the proof) fundamental theorem of probability of extinction in Branching Process.

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Course Code: *PGSTAT-07(N)/MASTAT-07(N)* *PGSTAT-01(N)/MASTAT-01(O)*	*Course Title:* *Mathematical Analysis*	*Maximum Marks : 30*

Section- A
Long Answer Questions

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

Maximum Marks: 18

1.   State & Prove Riemann Stieltjes integrals.

2.   State & Prove Baire's theorem.

3.   Define compact spaces & compact sets.

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) MP tests (b) UMP tests

2.   Discuss about the CRK bound.

3.   Discuss in short (a) BAN estimator (b) CAN estimator

4.   Discuss about the Bhattacharya bound.

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

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 Heine-Borel theorem.

2. State and prove Fubini's theorem.

3. State and prove Radon- Nikodym 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 about the Leibnitz rule.

3. Define Borel measurable function and it utility in statistics.

4. State and prove Fatou's lemma.

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

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

Section- A
Long Answer Questions

Note: Attempt all 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. Estimate the moment generating function distribution. Whether its mean exits.

Section - B

Short Answer Questions

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

Maximum Marks: 12

1. Define reliability. Also, differentiate it from quality, clearly.

2. What do mean by a coherent system.

3. Discuss utility of cut and path sets.

4. Describe Reliability function and Hazard rate.

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Course Code: PGSTAT-11(N)/ MASTAT -11(N)	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. Write a detailed not on classification of models used in operations research.

3. Solve the following LPP :

Max $\quad Z = 5x - 2y + 3z$
subject to $\quad 2x + 2y - z \geq 2$
$\qquad\qquad 3x - 4z \leq 3$
$\qquad\qquad y + 3z \leq 3$
and $\qquad x, y, z \geq o$

Section - B
Short Answer Questions

Maximum Marks: 12

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

1. Discuss in brief about the Hungarian method.

2. Describe the graphical method for $2 \times n$ or $m \times 2$ games.

3. Soles the following LPP graphically (give all steps).
Max. $Z = 3x + 2y$, subject to $x-y \leq 1$, $x+ y \geq 3$ and x, y $\geq$ o.

4. Write a brief note a various types of variables used in LPP.

Course Code: *PGSTAT-13(N)/MASTAT-13(N)* *PGSTAT-09(O)/MASTAT-09 (O)*	Course Title: *Decision Theory*	*Maximum Marks : 30*

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 Optimal Decision Rules.

2. State and Prove complete class Theorem.

3. State is 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. What is the equalizer rule. Discuss about it.

3. Write a note on Extended Bayes Rule.

4. Write short notes on (a) Admissibility (b) Completeness

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

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 Maholanobis D^2 with its various applications.

3. Discuss about multiple and partial correlation coefficient.

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. Write short notes on Discriminate Analysis.

3. Obtain MLE of mean vector for multivariate normal population.

4. Maximum likelihood estimates of mean vector.

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Course Code: PGSTAT-15(N)/MASTAT-15(N) PGSTAT-11(O)/MASTAT-11 (O)	Course Title: Nonparametric	Maximum Marks : 30

Section- A
Long Answer Questions

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

Maximum Marks: 18

1. Describe two Sample Kolmogorov Smirnov test.

2. What do you understand by order statistics? Discuss their role in non-parametric theory. Obtain the joint distribution of maximum and minimum order statistics.

3. What do you mean by two sample location test? Discuss sign test for two sample problem.

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 Wilcoxan test.

2. Write short notes on (a) Run test (b) Sign test.

3. Discuss about the Pitman ARE.

4. Write a note on merits and demerits of non-parametric tests.

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Course Code: *PGSTAT-16(N)/MASTAT-16(N)* *PGSTAT-12(O)/MASTAT-12 (O)*	*Course Title:* *Econometrics*	*Maximum Marks : 30*

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. Discuss about the Point and interval Predictors.

2. Write shout notes on R^2 an adjusted R^2

3. What is multi co-linearity?

4. Discuss Durbin-Watson test.

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Course Code: *PGSTAT-17(N)/MASTAT-17(N)* *PGSTAT-13(O)/MASTAT-13 (O)*	*Course Title:* *Demography*	*Maximum Marks : 30*

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. Discuss about the migration with its type and deferent methods of estimation.

2. Write shout notes on (a) Mean Length of Generation (b) Expectation of life

3. Explain basic concept of stable and stationary population.

4. Define IMR (Infant mortality rate) and CEB (Children ever Born).

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

Section- A
Long Answer Questions

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

Maximum Marks: 18

1. What is Research. Give the Criteria of a good research problem.

2. Discuss about the Different methods of data Collection.

3. Write a note on Analysis of Covariance.

Section - B

Short Answer Questions

Note: Answer all 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. Define Research Design.

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

Section- A
Long Answer Questions

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

Maximum Marks: 18

1. Volcanologist have measured the hydrogen content (in % of total number of atoms) of sample of gases collected from the 1970 and 1971 Mount Etna volcanic eruptions. Values are given in the following table:

1970 Hydrogen Content (%)		1971 Hydrogen Content(%)	
35.8	38.5	42.0	45.0
45.5	36.0	57.0	44.6
35.5	40.5	42.0	48.5
32.0	35.5	54.5	63.0
50.0	45.5	35.0	55.0
39.0	37.0	52.0	40.0
37.0	36.0	43.5	37.5
47.0	53.0	48.0	53.7

(a) Calculate a mean hydrogen content value for the 1970 eruption and use Student's t-distribution to find the 95% confidence limits for the true value.

(b) Use the Student's t-test for comparing means to determine whether there is a difference in the hydrogen content of the gases between the two eruption at the 99% confidence level.

2. 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.

3. Write a MATLAB function to calculate the maximum of ten numbers.

Section - B

Short Answer Questions

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

Maximum Marks: 12

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

    a. grid ( )

    b. plot ( )

    c. title ( )

2. What is an R data frame? How is it different from a matrix.

3. Write short notes on SPSS. Also define the Data view and variable view.

4. Define (i) An Ergodic Markov Chain, (ii) Stationary Markov Chain.

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Course Code: PGSTAT-22(N)/MASTAT-22 (N)	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. Discuss about the various optical agencies responsible for data Collection.

3. Write an essay on the cost of living index number in India.

Section - B

Short Answer Questions

Maximum Marks: 12

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

1. Discuss about the principle of local control and randomization.

2. Discuss about the Hypothesis. Also give its types.

3. What is Census?

4. Define migration how can its effects the population of any area.