S.S JAIN SUBODH P.G.(AUTONOMOUS) COLLEGE JAIPUR

M.SC. (STATISTICS) I SEMESTER

ASSIGNMENT

Subject:- MSST-101: Statistical Mathematics

UNIT: I

Question: 1

Find the rank of given matrix

$$\begin{bmatrix} 1 & 3 & 2 \\ 4 & 1 & -2 \\ 2 & -3 & 1 \end{bmatrix}$$

Question: 2

Check the consistency of following system of linear equations and solve if the system is consistent

$$\begin{cases} 4x + 3y - 6z = 10 \\ -x + 2y - 5z = 6 \\ 7x - y + z = 8 \end{cases}$$

UNIT: II

Question: 3

Verify Caleys Hamilton theorem for the following matrix

$$\begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{bmatrix}$$

Question: 4

Find the corresponding matrix which transforms the following matrix to a diagonal form.

$$\begin{bmatrix} -1 & 2 & -2 \\ 1 & 2 & 1 \\ -1 & -1 & 0 \end{bmatrix}$$

UNIT: III

Question: 5

Find the extreme values of the function. $f(x, y) = x^3 + y^3 - 3x - 12y + 2$

Question: 6

Check the continuity of the following function at the point 1 and -1

$$f(x) = |x + 1| + |x - 1|$$

UNIT: IV

Question: 7

State and prove Rolle's Theorem.

Question: 8

(a) If *a be any finite positive number quantity, evaluate*

$$\int_0^\infty \frac{e^{-x} sinmx}{x} dx \text{ and hence deduce the value of } \int_0^\infty \frac{sinmx}{x} dx$$

M.Sc. First Semester
STATISTICS
SECOND PAPER
Probability Theory
Assignment

Attempt any four questions

UNIT-I

Q.1) Define probability and conditional probability. State and Prove Multiplication law of probability.

Q.2) State and prove Bayes theorem and $P\left(\bigcup_{i=1}^{n} A_i\right) \leq \sum_{i=1}^{n} P(A_i)$

UNIT-II

Q.3) What do you understand by random variables, probability mass function, probability density function, joint distribution and conditional distributions.

Q.4) A random variable X has the following probability distribution:

x :	0	1	2	3	4	5	6	7
$p(x)$:	0	k	2k	2k	3k	k^2	$2k^2$	$7k^2+k$

(i) Find k, (ii) Evaluate $P(X<6)$, $P(X \geq 6)$ and $P(0<X<5)$, (iii) if $P(X \leq c) > \frac{1}{2}$, find the minimum value of c and (iv) Determine the distribution function of X.

UNIT-III

Q.5) What is mathematical expectation and state and proof addition theorem of expectation. If X is a random variable and 'a' is constant, then

(i) $E\lfloor\lceil a\Psi(X)\rceil\rfloor = a\,E\lceil\lfloor\Psi(X)\rceil\rfloor$

(ii) $E\lceil\lfloor\Psi(X)+a\rceil\rfloor = E\lceil\lfloor\Psi(X)\rceil\rfloor + a$

where $\Psi(X)$, a function of X, is a r.v. and all the expectations exist.

Q.6) Define moment generating function, cumulative generating function and characteristic function. State and proof Chebyshev Inequality.

UNIT-IV

Q.7) Define convergence in probability and Weak law of large numbers.

Q.8) State and prove Central limit theorem for a sequence of independent and Borel-Cantelli Lemma.

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M.Sc. (Statistics)

Paper - II

Statistical Inference - II

Assignment October 2025

Attempt any four questions.

Unit – I

Q1 Explain Pitman estimator for location.

Q2 State and prove Hazor Bazar's theorem.

Unit -II

Q3 State and prove Lehman – Schaeffer's theorem.

Q4 Explain minimal sufficient statistics with example.

Unit -III

Q5 State and prove generalised Neyman's Lemma.

Q6 Explain the concept of UMPU tests for the exponential family of distributions.

Unit - IV

Q 7 Write detail notes on Generalised Baye's Rule and Randomization optimal decision rules.

Q8 Explain a two- person zero sum game. When it becomes a decision problem.

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M.Sc. (Statistics)

Paper - V

Numerical Analysis

Assignment October 2025

Attempt any four questions.

Unit – I

Q1 Derive the Newton's divided difference formula for unequal interval. How will you deduce Newton-Gregory formula from it?

Q2 Derive the Newton – Gregory formula for Backward Interpolation.

Unit - II

Q3 Compute the value of following integral by Trapezoidal rule:

$$\int_{0.2}^{1.4} (\sin x - \log_e x + e^x)\, dx$$

Q4 Using Runge – Kutta method, solve the equation $\frac{dy}{dx} = x + y$, with initial condition y(0) = 1 from x = 0.1 to x = 0.4 when h = 0.1.

Unit - III

Q5 Derive Eular – Maclaurin's summation formula.

Q6 Use the method of inverse interpolation to find the root of the equation x^3-6x-11 = 0 that lies between 3 and 4.

Unit - IV

Q7 Find the real root of the equation x^3-3x-5 = 0 correct to four places of decimals by Newton – Raphson method.

Q8 Solve the system of linear equation 2x+3y+z = 9, x+2y+3z = 6, 3x+y+2z = 8 by the factorization method.

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M.Sc. (Statistics)

Paper -III

Sample Surveys - I

Assignment October 2025

Attempt any four questions.

Unit – I

Q1 Explain in detail the planning and execution of a large-scale survey.

Q2 Give comparison of complete enumeration and sample surveys for collecting information of population.

Unit - II

Q3 Define Simple Random Sampling. Derive an unbiased estimator for population mean, variance in case of Simple Random Sampling without replacement

Q4 Explain the purpose of stratification in sample survey. Estimate population mean and its variance for proportional and Neyman allocation.

Unit – III

Q5 Show that the systematic sampling is more precise than the simple random sampling, if the variance within the systematic sampling is larger than the population variance as a whole.

Q6 What are the chief advantages and disadvantages of cluster sampling? Under what circumstances, cluster sampling is adopted.

Unit - IV

Q7 What is two- stage sampling. How will you estimate the variance of a two- stage estimator?

Q8 Define ratio method of estimation. Find the variance of the estimator to the first degree of approximation.

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(AUTONOMOUS)

ASSIGNMENT

M.Sc Semester – III

ATTEMPT ANY FOUR QUESTIONS

UNIT 1

Q1. State and prove Gauss-Markoff theorem for correlated variables.

Q2.Give three independent stochastic variates y_1, y_2 and y_3 having a common variance σ^2 such that $E(y_1) = \theta_1 + \theta_2$, $E(y_2) = \theta_1 + \theta_3$ and $E(y_3) = \theta_1 + \theta_2$. Show that $l_1\theta_1 + l_2\theta_2 + l_3\theta_3$ is estimable iff $l_1 = l_2 + l_3$. Find an unbiased estimate of σ^2.

UNIT 2

Q3. Prove that a connected design is balanced if all the v-1 non zero characteristic roots of c-matrix.

Q4. Explain the general structure and analysis of block designs.

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Q5. What do you mean by two way elimination of heterogeneity? Give the analysis of Youden square designs.

Q6. How do you classify PBIBD designs? Give the analysis of group divisible design.

UNIT 4

Q7. Construct SBIBD with parameters v=b=21, r=k=5 and $\lambda=1$.

Q8. For a balanced binary design with equal no. of replications. $V \leq b$.

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M.Sc. (Statistics)

Semester – III

Paper – IV Econometrics

Assignment

Attempt any four questions.

Unit - I

Q1How do econometricians proceed in their analysis of an economic problem? Discuss the classical or traditional methodology in detail.

Q2 What is the method of OLS of regression analysis? Discuss the assumptions underlying this method of least squares and their consequences.

Unit - II

Q3 Explain the nature of the problem of autocorrelation. How will you detect it? Discuss the method of generalized least squares (GLS).

Q4 Explain graphically the nature of multicollinearity and its consequences. What are remedial measures if multicollinearity is serious?

Unit - III

Q5 Differentiate between under identification, exact identification and over identification and give one example of each. What are the rules for identification?

Q6 What is the difference between single equation model and simultaneous equation model? Explain the problem of identification in simultaneous equation model.

Unit - IV

Q7 Write Short notes on Heteroscedastic disturbances and Ridge regression.

Q8 Explain k- class estimators.