

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)
MSc DEGREE EXAMINATION DECEMBER 2024
(First Semester)

Branch - STATISTICS

REAL ANALYSIS AND LINEAR ALGEBRA

Time: Three Hours

Maximum: 75 Marks

SECTION-A (10 Marks)

Answer ALL questions

ALL questions carry EQUAL marks

(10 × 1 = 10)

Module No.	Question No.	Question	K Level	CO
1	1	Which of the following is uniformly continuous in R ? (a) $f(x) = x^2$ (b) $f(x) = \sin(x)$ (c) $f(x) = e^x$ (d) $f(x) = \frac{1}{x}$ on $(0, \infty)$	K1	CO1
	2	The function $f(x) = \frac{x^2 - y^2}{x^2 + y^2}$ is (a) Continuous at (0,0) (b) Differentiable at (0,0) (c) Not continuous at (0,0) (d) Uniformly continuous on R^2	K2	CO2
2	3	The sequence $a_n = (-1)^n$ is (a) Convergent (b) Divergent (c) Oscillating but convergent (d) Monotonic	K1	CO1
	4	Which of the following tests is most useful in determining whether a series is conditionally convergent? (a) Root Test (b) Ratio Test (c) Alternating Series Test (d) Integral Test	K2	CO2
3	5	The Fundamental Theorem of Calculus relates the Riemann integral and (a) The derivative of a function (b) The sum of a series (c) The limits of sequences (d) The Taylor series expansion of a function	K1	CO1
	6	If $f(x) = x^2$ in the interval $[1,3]$, what is the value of 'c' according to first mean value theorem. (a) $c = 2$ (b) $c = 2.5$ (c) $c = 3.2$ (d) $c = 4.3$	K2	CO2
4	7	The set of all vectors together with the two basic operations is (a) Orthogonal space (b) Vector space (c) Linear space (d) Metric space	K1	CO2
	8	The norm induced by the inner product $\langle u, v \rangle$ is defined as (a) $\ u\ = \langle u, v \rangle$ (b) $\ u\ = \langle u, u \rangle$ (c) $\ u\ = \sqrt{\langle u, v \rangle}$ (d) $\ u\ = \sqrt{\langle u, u \rangle}$	K2	CO1
5	9	The of a matrix A is the common value of the row rank of A and the column rank of A . (a) Nullity (b) Orthogonality (c) Rank (d) transformation	K1	CO1
	10	An $m \times n$ matrix A is said to be if its rank is m, (a) Row rank (b) Column rank (c) Full row rank (d) Full column rank	K2	CO2

Cont...

SECTION - B (35 Marks)

Answer ALL questions

ALL questions carry EQUAL Marks

(5 × 7 = 35)

Module No.	Question No.	Question	K Level	CO
1	11.a.	Prove that if f is a continuous real valued function on the interval J , and if $f'(x) > 0$ for all x in J except possibly the end points of J , then f is strictly increasing on J .	K2	CO2
		(OR)		
	11.b.	Find the maxima and minima of the function $f(x,y) = x^2 + y^2 - 3x - 12y + 20$		
2	12.a.	If $\{S_n\}_{n=1}^{\infty}$ is a sequence of real numbers which converges to L , then prove that $\{S_n^2\}_{n=1}^{\infty}$ converges to L^2	K2	CO4
		(OR)		
	12.b.	If b_n is a positive monotone decreasing function and if $\sum u_n$ is a convergent series, then prove that the series $\sum u_n b_n$ is also convergent.		
3	13.a.	If $f \in R[a,b]$ and $a < c < b$, then prove that $f \in R[a,c], *f \in R[c,b]$ and $\int_a^b f = \int_a^c f + \int_c^b f$	K1	CO2
		(OR)		
	13.b.	Prove that if a function defined on $[a,b]$ is [i] continuous on $[a,b]$ and [ii] derivable on $]a,b[$		
4	14.a.	Prove the intersection of any two subspaces S and T of a vector space V is a subspace of V .	K2	CO2
		(OR)		
	14.b.	Prove that every subspace S of a finite dimensional inner product space has an orthogonal basis. Moreover, any orthogonal subset of S can be extended to an orthogonal basis of S .		
5	15.a.	Let A and B be two matrices of order $m \times n$ and $n \times m$ respectively, where $m \leq n$. Then prove that $\chi_{BA}(\lambda) = \lambda^{n-m} \chi_{AB}(\lambda)$.	K1	CO1
		(OR)		
	15.b.	Prove that a number α is an Eigen value of A iff α is a characteristic root of A .		

SECTION - C (30 Marks)

Answer ANY THREE questions

ALL questions carry EQUAL Marks

(3 × 10 = 30)

Module No.	Question No.	Question	K Level	CO
1	16	Expand $x^2y + 3y - 2$ in powers of $x-1$ and $y+2$ using Taylor's series.	K2	CO2
2	17	Show that the series $\sum_1^{\infty} \frac{(-1)^{n-1}}{n+x^2}$, is uniformly convergent but not absolutely for all real values of x .	K2	CO1
3	18	If $f \in R[a,b]$ and λ is any real number, then prove that $\lambda f \in R[a,b]$ and $\int_a^b \lambda f = \lambda \int_a^b f$	K1	CO2
4	19	Let $B = \{x_1, x_2, \dots, x_n\}$ be an orthogonal basis of an inner product space V . then prove that for any $x \in V$, we have $x = \sum_{j=1}^n \langle x, x_j \rangle x_j$	K2	CO2
5	20	Prove that any quadratic form $X^T A X$ can be reduced to a diagonal form by a non singular transformation of the variables.	K1	CO2

Z-Z-Z

END

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

MSc DEGREE EXAMINATION DECEMBER 2024
(First Semester)

Branch – STATISTICS

ADVANCED PROBABILITY THEORY

Time: Three Hours

Maximum: 75 Marks

SECTION-A (10 Marks)

Answer ALL questions

ALL questions carry EQUAL marks

(10 × 1 = 10)

Module No.	Question No.	Question	K Level	CO
1	1	Conditional variance of a variable X for given Y=y in terms of conditional expectation can be expressed as: (a) $V(X/Y = y) = E(Y^2/X = x) - [E(X/Y = y)]^2$ (b) $V(X/Y = y) = [E(Y/X = x)]^2 - [E(X^2/Y = y)]$ (c) $V(X/Y = y) = E(X^2/X = x) - [E(X/Y = y)]^2$ (d) $V(X/Y = y) = E(X^2/Y = y) - [E(X/Y = y)]^2$	K1	CO1
	2	$P(X - m_i \geq k\sigma) \leq \frac{1}{k^2}$, for every positive k, denotes _____ inequality. (a) Chebyshev (b) Holders (c) Jensen (d) Markov	K2	CO1
2	3	The characteristic function of a Cauchy distribution $\phi(u), u \in R$ is _____. (a) u (b) 1/ u (c) exp(u) (d) exp(- u)	K1	CO2
	4	Distribution function F of a random variable and its _____ function determine each other. (a) density (b) characteristic (c) probability (d) continuity	K2	CO2
3	5	If A and B^c are independent then $P(AB^c) =$ _____. (a) $PA + PB^c$ (b) $PA - PB^c$ (c) $PA \cdot PB^c$ (d) PA/PB^c	K1	CO3
	6	Tail events of a sequence of independent random variables have for their probability either zero or one where tail functions are almost surely degenerate is the statement of _____. (a) Kolmogorov 0-1 law (b) Borel 0-1 law (c) Borel –Cantelli lemma (d) weak law of large numbers.	K2	CO3
4	7	Let $X_n \xrightarrow{P} X$ and $Y_n \xrightarrow{P} Y$. then $aX_n \xrightarrow{P} ?$ (where a is real) (a) a (b) X_n (c) Y_n (d) aX	K1	CO4
	8	A sequence of random variables converges almost surely to a random variable if the sequence converges _____. (a) mutually almost surely (b) pairwise almost surely (c) mutually (d) pairwise	K2	CO4
5	9	In proving the De Moivre-Laplace theorem, the sequence $\{Y_n\}$ of standardized random variables is from _____ distribution. (a) Poisson (b) Laplace (c) Binomial (d) Normal	K1	CO5
	10	If the sum of random variables has an asymptotically normal distribution, then we say that it satisfies _____ theorem. (a) central limit (b) Cauchy (c) Levy (d) Khinchine	K2	CO5

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SECTION - B (35 Marks)

Answer ALL questions

ALL questions carry EQUAL Marks (5 × 7 = 35)

Module No.	Question No.	Question	K Level	CO
1	11.a.	Obtain mean of Hypergeometric distribution.	K4	CO1
		(OR)		
	11.b.	Construct Jensen's inequality.	K5	
2	12.a.	If X follows standard normal variate, then find the characteristic function of X.	K3	CO2
		(OR)		
	12.b.	Build the necessary condition of Bochner's theorem.	K2	
3	13.a.	Let X and Y be two independent random variables taking the values +1 and -1 with probability $\frac{1}{2}$ each. If $Z=XY$, prove that X, Y, Z are pairwise independent, but not mutually independent.	K3	CO3
		(OR)		
	13.b.	Prove that sub-classes of independent classes are independent.	K5	
4	14.a.	State and prove Helly Bray's lemma.	K5	CO4
		(OR)		
	14.b.	Discuss the convergence of random variables and probability.	K6	
5	15.a.	Explain Kolmogorov's strong law of large numbers.	K2	CO5
		(OR)		
	15.b.	Discuss the statements of (a) Liapounov's and (b) Lindeberg Feller's central theorem with applications.	K6	

SECTION - C (30 Marks)

Answer ANY THREE questions

ALL questions carry EQUAL Marks (3 × 10 = 30)

Module No.	Question No.	Question	K Level	CO
1	16	State and prove C_r inequality.	K5	CO1
2	17	Derive the inversion formula based on characteristic functions.	K3	CO2
3	18	State and prove Borel-Cantelli Lemma.	K5	CO3
4	19	Defend: $X_n \xrightarrow{r} X \Rightarrow E X_n ^r \rightarrow E X ^r$.	K4	CO4
5	20	State and prove Lindeberg-Levy's Theorem.	K5	CO5

Z-Z-Z

END

**PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)**

**MSc DEGREE EXAMINATION DECEMBER 2024
(First Semester)**

Branch - STATISTICS

OPERATIONS RESEARCH

Time: Three Hours

Maximum: 75 Marks

SECTION-A (10 Marks)

Answer ALL questions

ALL questions carry EQUAL marks

(10 × 1 = 10)

Module No.	Question No.	Question	K Level	CO
1	1	If the current basic solution in dual simplex method is infeasible, then the values of basic variables will be a) ≥ 0 b) < 0 c) ≤ 0 d) > 0	K1	CO1
	2	Post-Optimal analysis is also known as a) Markov analysis b) Sensitivity analysis c) Decision analysis d) Goal programming	K2	CO1
2	3	In inventory management, price break means a) Price discount b) Quantity discount c) Shortage cost d) Ordering cost	K1	CO2
	4	In ABC analysis the inventory items are classified on the basis of a) Consumption value b) Criticality of the item c) Value of items in storage d) Nature of suppliers	K2	CO2
3	5	A customer of low priority is serviced before a high priority customer is known as a) Pre-emptive b) Balked c) Non-pre-emptive d) Reneged	K1	CO3
	6	The server utilization factor is also called a) Free period b) Busy period c) Traffic intensity d) Both b) and c)	K2	CO3
4	7	The cost slope formula is a) $\frac{\text{Crash cost} - \text{Normal cost}}{\text{Crash time} - \text{Normal time}}$ b) $\frac{\text{Normal cost} - \text{Crash cost}}{\text{Crash time} - \text{Normal time}}$ c) $\frac{\text{Normal cost} - \text{Crash cost}}{\text{Normal time} - \text{Crash time}}$ d) $\frac{\text{Crash cost} - \text{Normal cost}}{\text{Normal time} - \text{Crash time}}$	K1	CO4
	8	The Monte-Carlo technique in simulation model is classified as simulation of _____ models. a) Deterministic b) Probabilistic c) Static d) Dynamic	K2	CO5
5	9	Select the appropriate answer for a non-linear programming problem where _____ is non-linear. a) Objective function b) One constraint c) More constraint d) All of these	K1	CO5
	10	Find out the correct answer related to the types of goal programming: a) Non-preemptive b) Pre-emptive c) Both a) and b) d) None of these	K1	CO5

SECTION - B (35 Marks)

Answer ALL questions

ALL questions carry EQUAL Marks

(5 × 7 = 35)

Module No.	Question No.	Question	K Level	CO
1	11.a.	Write a note on post-optimal sensitivity analysis.	K2	CO1
		(OR)		
	11.b.	Explain the type of variations in an LPP usually studied by post-optimal analysis.	K2	CO1

Cont...

2	12.a.	Find the optimal order quantity for a product for which the price breaks are as follows: Quantity Unit cost(Rs) $0 \leq Q_1 < 500 \quad 25.00$ $500 \leq Q_2 < 1500 \quad 24.80$ $1500 \leq Q_3 < 3000 \quad 24.60$ $3000 \leq Q_4 \quad 24.00$ The annual demand for the product is 500 units, the cost of storage per unit per year is 10% of the unit cost and the cost of ordering per order is Rs.180.	K3	CO2
	(OR)			
	12.b.	Enumerate the various types of inventory models.	K3	CO2
3	13.a.	Briefly explain the important characteristics of queueing system.	K4	CO3
	(OR)			
	13.b.	A supermarket has a single cashier. During the 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 average number of customers in the queueing system (iii) The average time a customer spends in the system.	K4	CO3
4	14.a.	What is crashing? Outline the steps of project crashing.	K5	CO4
	(OR)			
	14.b.	Summarize the advantages and disadvantages of using simulation.	K5	CO4
5	15.a.	Use the Kuhn-Tucker conditions to solve the following non-linear programming problem: Minimize $z = 2x_1^2 + 12x_1x_2 - 7x_2^2$ Subject to the constraints: $2x_1 + 5x_2 \leq 98$, $x_1, x_2 \geq 0$	K5	CO5
	(OR)			
	15.b.	Write short notes on: (i) Quadratic programming and (ii) Goal programming	K5	CO5

SECTION -C (30 Marks)

Answer ANY THREE questions

ALL questions carry EQUAL Marks (3 × 10 = 30)

Module No.	Question No.	Question	K Level	CO
1	16	Use dual simplex method to solve the following LPP: Minimize $z = 3x_1 + x_2$ Subject to : $x_1 + x_2 \geq 1$, $2x_1 + 3x_2 \geq 2$, $x_1, x_2 \geq 0$	K3	CO1
2	17	The demand for a purchased item is 1,000 units/month and shortages are allowed. If the unit cost is Rs. 1.50 per unit, the cost of making one purchase is Rs.600, the holding cost for one unit is Rs.2 per year and the cost of one shortage is Rs.10 per year. Determine: (i) The optimum purchase quantity (ii) The number of orders per year (iii) The optimum total yearly cost.	K4	CO3
3	18	Explain the (M/M/C): (∞ /FCFS) queueing model with its characteristics by giving a suitable example.	K2	CO3
4	19	A project consists of eight activities with the following relevant information: Activity: A B C D E F G H Immediate Predecessor: - - - A B C D, E F, G t_0 : 1 1 2 1 2 2 3 1 t_m : 1 4 2 1 5 5 6 2 t_p : 7 7 8 1 14 8 15 3 (i) Draw the PERT network and find the expected project completion time. (ii) Find the critical path and its variance.	K3	CO4
5	20	Explain the non-linear programming problem of constrained maxima and minima type.	K5	CO5

Z-Z-Z

END

**PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)**

**MSc DEGREE EXAMINATION DECEMBER 2024
(Second Semester)**

**Branch- STATISTICS
DISTRIBUTION THEORY**

Time: Three Hours

Maximum: 75 Marks

SECTION - A (10 Marks)

Answer ALL questions

ALL questions carry EQUAL marks (10 × 1 = 10)

Module No.	Question No.	Question	K Level	CO
1	1	An observation is right censored at X if it is recorded at its observed value is _____ u a) <u b) >u c) =u d) 0	K1	CO1
	2	If X is a Poisson variate also the distribution of X is the sum of x+1 terms then the distribution function of poisson variate is a) Incomplete Beta distribution of 1 st kind b) Incomplete Beta distribution of 2 nd kind c) Incomplete gamma distribution d) Cauchy distribution.	K2	CO1
2	3	Let $F_r(x)$ $r = 1, 2, \dots, n$ denote the c.d.f of r^{th} order statistic then c.d.f of $F_n(x)$ of the smallest order statistic $X_{(n)}$ is given by a) $1-F(x)^n$ b) $F(x)^n$ c) $1-(1-F(x))^n$ d) $1-F(x)$	K1	CO2
	4	The ratio of two independent chi-square variates each divided by the corresponding degrees of freedom has a) non- central F distribution b) non-central t distribution c) central F distribution d) central t distribution	K2	CO2
3	5	In deriving the bivariate normal distribution the assumption regarding the regression of Y on X is a) linear b) non-linear c) quadratic d) exponential	K1	CO3
	6	The multivariate normal distribution is said to be singular if variance and covariance matrix is a) unit b) triangular c) singular d) non singular	K2	CO3
4	7	Whishart distribution is th generalized form of a) gamma distribution b) chisquare distribution c) t distribution d) none of the above	K1	CO4
	8	The test function of Hotelling T^2 is used to test the difference between a) sample mean vector and population mean b) sample mean and population mean c) two sample mean d) two sample variances	K2	CO4
5	9	_____ analysis is the techniques which is used to identify set of variable which has more influence on dependent variable. a) Discriminant b) Principal component c) Factor d) SEM	K1	CO5
	10	Canonical correlation is a technique which is used to identify the pairs of variable which has _____ magnitude of correlation coefficient. a) least b) high c) zero d) one	K2	CO5

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SECTION - B (35 Marks)

Answer ALL questions

ALL questions carry EQUAL Marks (5 × 7 = 35)

Module No.	Question No.	Question	K Level	CO
1	11.a.	If $X \sim B(n, p)$, right truncated Binomial distribution at $x=n$ then find its mean and variance.	K 2	CO1
		(OR)		
	11.b.	If X and Y are independent rectangular variate on (0,1) Find the p.d.f of i) $X+Y$ ii) $X-Y$		
2	12.a.	Derive cumulative function of a single order statistic.	K 2	CO2
		(OR)		
	12.b.	Let $X_1, X_2, X_3, \dots, X_n$ be a random sample from a population with continuous density. Show that $Y_1 = \min(X_1, X_2, X_3, \dots, X_n)$ is exponential with $n\lambda$ if and only if each X_i is exponentially distributed with parameter λ .		
3	13.a.	Derive the mean of multivariate normal distributions.	K 3	CO3
		(OR)		
	13.b.	Derive the distribution of linear function $y=cx$ of a multivariate normal distribution.		
4	14.a.	Derive the characteristic function of Whishart distribution.	K 2	CO4
		(OR)		
	14.b.	Establish Invariant of T^2 under linear transformation.		
5	15.a.	Explain Discriminant function.	K 4	CO5
		(OR)		
	15.b.	Explain Principal Component analysis.		

SECTION - C (30 Marks)

Answer ANY THREE questions

ALL questions carry EQUAL Marks (3 × 10 = 30)

Module No.	Question No.	Question	K Level	CO
1	16	Derive the distribution function of a Binomial Variate.	K 2	CO1
2	17	Derive the probability density function of non-central χ^2 .	K 3	CO2
3	18	Derive the distribution of the quadratic function in Normal variates.	K 3	CO3
4	19	Explain Mahalanobis D^2 distribution and establish the relation between T^2 and D^2	K 3	CO4
5	20	Explain Canonical Correlations.	K 4	CO5

Z-Z-Z

END

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

MSc DEGREE EXAMINATION DECEMBER 2024
(Second Semester)

Branch - STATISTICS

LINEAR MODELS AND DESIGN OF EXPERIMENTS

Time: Three Hours

Maximum: 75 Marks

SECTION-A (10 Marks)

Answer ALL questions

ALL questions carry EQUAL marks

(10 × 1 = 10)

Module No.	Question No.	Question	K Level	CO
1	1	The Gauss-Markov theorem will not hold if _____. a. the error term has the same variance given any values of the explanatory variables b. the error term has an expected value of zero given any values of the independent variables c. the independent variables have exact linear relationships among them d. the regression model relies on the method of random sampling for collection of data	K1	CO1
	2	Analysis of variance is a statistical method of comparing the _____ of several populations. a. standard deviations b. variances c. means d. proportions	K2	CO1
2	3	What should be the criteria for applying RBD? (a). Fertility gradient in field is in two direction (b). Fertility gradient in field is in one direction only (c). Both a and b (d). None of the above	K1	CO2
	4	The word "Latin" is used due to Euler who used Latin letters for symbols of a. Factors b. Levels c. Observations. d. Treatments	K2	CO2
3	5	When a researcher plans a study to examine the effect of three fully-manipulated independent variables on a single dependent variable, the research is using a: a. a single-case experimental design b. a quasi-experimental design c. a factorial design d. a correlational design	K1	CO3
	6	A _____ effect(s) analysis examines mean differences at each level of the independent variable. a). main b) simple main c) interaction d) simple interaction	K2	CO3
4	7	In BIBD every pair of treatment should occur λ times together in the design, thus constraint on BIBD sometimes requires very large number of blocks or very large block size. To overcome this difficulty we consider a. PBIBD b. SSPD c. SSPD and ANOVA d. ANOCOVA	K1	CO4
	8	Some pairs of treatments appear together λ_1 times, some pairs of treatments appear together λ_2 times.....and the remaining pairs λ_m times. a) In BIBD b) In PBIBD c) In GLSD d) In RCBD	K2	CO4

Cont...

5	9	The uncontrollable factors are also called _____ a) Designed factors b) Noise factors c) Acceptance factors d) Sound factors	K1	CO5
	10	Which of these can be used to develop a new process? a) Design of experiments b) Acceptance sampling c) Control charts d) Histogram	K2	CO5

SECTION - B (35 Marks)Answer **ALL** questions**ALL** questions carry **EQUAL** Marks

(5 × 7 = 35)

Module No.	Question No.	Question	K Level	CO
1	11.a.	Outline the applications of Analysis of variance.	K2	CO1
		(OR)		
	11.b.	Demonstrate the mixed plot technique.		
2	12.a.	Examine the principles of design of experiment.	K4	CO2
		(OR)		
	12.b.	Derive the missing plot technique for RBD.		
3	13.a.	Classify the types of confounding.	K4	CO3
		(OR)		
	13.b.	Explain Complete confounding and its advantages.		
4	14.a.	State the importance of incomplete block design.	K5	CO4
		(OR)		
	14.b.	Describe the relations of parameter in BIBD.		
5	15.a.	Evaluate the weighing design and response surface design.	K5	CO5
		(OR)		
	15.b.	Explain the feller theorem and its applications.		

SECTION - C (30 Marks)Answer **ANY THREE** questions**ALL** questions carry **EQUAL** Marks

(3 × 10 = 30)

Module No.	Question No.	Question	K Level	CO
1	16	Illustrate the Gauss Markov's Theorem and its applications.	K2	CO1
2	17	Construct the model for ANOCOVA technique for RBD.	K3	CO2
3	18	Discover the 3 ⁿ factorial experiments.	K4	CO3
4	19	Explain the analysis of BIBD using Intra block information.	K4	CO4
5	20	Construct analysis of cross over design.	K3	CO5

Z-Z-Z END

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)
MSc DEGREE EXAMINATION DECEMBER 2024
(Third Semester)

Branch - STATISTICS

HYPOTHESES TESTING

Time: Three Hours

Maximum: 75 Marks

SECTION-A (10 Marks)

Answer ALL questions

ALL questions carry EQUAL marks

(10 × 1 = 10)

Module No.	Question No.	Question	K Level	CO
1	1	A hypothesis may be classified as (a) simple (b) composite (c) null (d) all the above	K1	CO1
	2	Level of significance is the probability of (a) type I error (b) type II error (c) not committing error (d) any of the above	K2	CO1
2	3	A test T which is at least as powerful as any other test of the same size is called (a) best test (b) most powerful test (c) uniformly most powerful test (d) none of the above	K1	CO2
	4	Neyman-Pearson lemma provides (a) an unbiased test (b) a most powerful test (c) an admissible test (d) Minimax test	K2	CO2
3	5	The ratio of the likelihood function under H_0 and under the entire parametric space is called (a) probability ratio (b) sequential probability ratio (c) likelihood ratio (d) none of the above	K1	CO3
	6	Student's t-test is applicable only when: (a) the variate values are independent (b) the variable is distributed normally (c) the sample is not large (d) all the above	K2	CO3
4	7	In sequential probability ratio test (SPRT), the sample size is (a) fixed (b) fixed but small (c) fixed but large (d) a random variable	K1	CO4
	8	In SPRT, decision about the hypothesis H is taken (a) after each successive observation (b) after a fixed number of observations (c) at least after five observation (d) when the experiment is over	K2	CO4
5	9	Kolmogorov-Smirnov test is a (a) one left-sided test (b) one-right-sided test (c) two-sided test (d) all the above	K1	CO5
	10	Non-parametric methods are based on (a) mild assumptions (b) stringent assumptions (c) no assumptions (d) none of the above	K2	CO5

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SECTION - B (35 Marks)Answer **ALL** questions**ALL** questions carry **EQUAL** Marks (5 × 7 = 35)

Module No.	Question No.	Question	K Level	CO
1	11.a.	What is meant by a statistical hypothesis? Explain the concept of type I and type II errors.	K3	CO1
		(OR)		
	11.b.	Explain the concept of most powerful test.		
2	12.a.	Difference between UMPUT and UMPST.	K4	CO2
		(OR)		
	12.b.	Show that UMP test is unbiased.		
3	13.a.	Construct the LR test for the mean of a normal population.	K4	CO3
		(OR)		
	13.b.	Show that the Binomial distribution possesses MLR property.		
4	14.a.	Describe Wald's sequential probability ratio test.	K5	CO4
		(OR)		
	14.b.	Derive their approximate expressions for the sequential probability ratio test.		
5	15.a.	What are the advantages and drawbacks of non-parametric method over parametric methods?	K4	CO5
		(OR)		
	15.b.	Explain the test procedure for Median test.		

SECTION -C (30 Marks)Answer **ANY THREE** questions**ALL** questions carry **EQUAL** Marks (3 × 10 = 30)

Module No.	Question No.	Question	K Level	CO
1	16	Explain the concept of most powerful test and discuss how the Neyman-Pearson lemma?	K4	CO4
2	17	Show that Every most powerful or uniformly most powerful critical region is necessarily unbiased.	K5	CO5
3	18	Explain the test for the equality of variances of two normal populations.	K5	CO5
4	19	Establish the relationship between SPRT and random walk.	K4	CO4
5	20	Explain in detail Kolmogorov – Smirnov two sample test.	K5	CO4

Z-Z-Z END