



Sri Indu

College of Engineering & Technology

UGC Autonomous Institution

Recognized under 2(f) & 12(B) of UGC Act 1956,
NAAC, Approved by AICTE &
Permanently Affiliated to JNTUH



NAAC
NATIONAL ASSESSMENT AND
ACCREDITATION COUNCIL



HANDOUT

II Year II Semester

DEPARTMENT OF AIML

ACADEMIC YEAR 2025-2026



SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY
(An Autonomous Institution under UGC, New Delhi)

(Permanently Affiliated to JNTUH, Approved by AICTE, New Delhi and Accredited by NBA, NAAC)
Sheriguda Village, Ibrahimpatnam Mandal, Ranga Reddy Dist - 501510

DEPARTMENT OF COMPUTER SCIENCE ENGINEERING
(ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)

HANDOUT-INDEX

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DEPARTMENT VISION

To develop competent engineers in the domain of Artificial Intelligence & Machine Learning for noteworthy contributions to the society.

DEPARTMENT MISSION

DM1: To strengthen academic collaborations for better exposure.

DM2: Promote professional environment to imbibe ethical values and entrepreneurial skills

DM3: Encourage research & development by emphasizing on innovation

DM4: Facilitate Industry-Institute collaboration for mutual benefit

PROGRAM EDUCATIONAL OBJECTIVES (PEOS)

PEO1: Generate contribution towards advancements in Artificial Intelligence and Machine Learning

PEO2: Promote design, research and implementation of products through strong communication skills, leadership and entrepreneurial skills.

PEO3: Apply basic principles and practices of AIML to successfully complete Software related projects to meet customer business objectives and/or productively engage in research.



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Program Outcomes (PO's)

PO1	Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	Design/Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	Individual and teamwork: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Educational Objectives (PEO's)

PEO1	Higher studies: Pursue innovation oriented higher education with high degree of research.
PEO2	Professional Career: Engage in best practice to get employed in Top notch companies.
PEO3	Domain Knowledge: Demonstrated professionalism to analyse and design the data science solutions.
PEO4	Lifelong Learning: Continual Learning with ethical principles to contribute to the human well-being and society.

Program Specific Outcomes (PSO's)

PSO1	Register mathematical methodology to crack problems using suitable data structures.
PSO2	Competence to design and develop software for web based and mobile androids under real world environment.
PSO3	Skill to design the algorithms for machine learning, data compression can be used in different applications.

	SRIINDUCOLLEGE OF ENGG & TECH (Regulation :R22) Department of CSE (ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)			Page(s):
	Sub.Code & Title (R22MTH2125) Mathematical and Statistical Foundations			
	Academic Year: 2025-26		Year/Sem./Section	II/II-SEM: AIML
	Faculty Name & Designation		Dr. Aadil Hamid, Assistant Professor	

COURSE OUTCOMES(CO's)

Academic Year :2025-26
Class :II YEAR-II SEM.
Course Name :MATHEMATICAL AND STATISTICAL FOUNDATION
 (R22MTH2125)

At the end of the course, the student will be able to

CO's	Course outcomes
C213.1	Apply the number theory concepts to cryptography domain (k3-apply)
C213.2	Apply the concepts of probability and distribution to some case studies (k3-apply)
C213.3	Calculate the areas under the normal curve & applications of the normal distribution (k3-apply)
C213.4	Analyze the fundamental sampling distributions (k4-Analyze)
C213.5	Test the Hypothesis of single mean, double mean, single proportion, double proportion (k2-understand)
C213.6	Evaluate Transition Probability matrix (K5-Evaluate)

COURSE ARTICULATION MATRIX

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C213.1	3	2	2	2	-	-	-	-	-	-	-	3	2	3	-
C213.2	3	3	2	2	-	-	-	-	-	-	-	3	3	3	-
C213.3	3	3	3	2	-	-	-	-	-	-	-	3	2	3	-
C213.4	3	3	3	3	-	-	-	-	-	-	-	3	3	3	-
C213.5	3	3	3	3	-	-	-	-	-	-	-	2	3	3	-
C213.6	3	3	3	3	-	-	-	-	-	-	-	2	2	3	-
C213	3	2.8	2.7	2.5	-	-	-	-	-	-	-	2.7	2.5	3	-

	SRIINDUCOLLEGE OF ENG & TECH (Regulation :R22)			Page(s):
	Department of CSE (ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)			
	Sub.Code & Title		(R22MTH2215) Mathematical and Statistical Foundations	
	Academic Year: 2025-26		Year/Sem./Section	II/II: AIML
Faculty Name & Designation		Dr. Aadil Hamid, Assistant Professor		

**Department of HUMANITIES & SCIENCES INDIVIDUAL
TIMETABLE**

TIME	09:40am To 10:40am	10:40am To 11:40am	11:40am To 12:40pm	L U N C H	1:20pm To 2:15pm	2:15pm To 3:10pm	3:10pm To 4:00pm
DAY	1	2	3		4	5	6
MON	AIML-B				AIML-C	AIML-A	
TUE		AIML-C	AIML-B				
WED	AIML-A	AIML-B					
THU			AIML-A			AIML-C	AIML-C
FRI							
SAT					AIML-C	AIML-A	

HOD

PRINCIPAL

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
DEPARTMENT CALENDAR-2025-2026(SECOND SEMESTER)

SRI INDU COLLEGE OF ENGINEERING AND TECHNOLOGY(AUTONOMOUS)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING(AI&ML) DEPARTMENT CALENDAR – 2025-2026(SEMESTER-II)

				Feb-26	Mar-26					
SUNDAY		Dec-25		1	1					Jun-26
MONDAY	1			2	2					1
TUESDAY	2			3	3	II YR CRT TRAINING	3	II YR CRT TRAINING		2
WEDNESDAY	3			4	4		4	Apr-26		3
THURSDAY	4		1	5	5		5		May-26	4
FRIDAY	5	AI CLUB MEETING	2	6	6	II YR CRT TRAINING	6	II YR CRT TRAINING	1	5
SATURDAY	6	DEPARTMENT MEETING	3	7	7	AI CLUB MEETING	7	AI CLUB MEETING	2	6
SUNDAY	7	HOLIDAY	4	8	8	HOLIDAY	8	HOLIDAY	3	7
MONDAY	8		5	9	9		9		4	8
TUESDAY	9		6	10	10	II YR CRT TRAINING	10	II YR CRT TRAINING	5	9
WEDNESDAY	10		7	11	11		11		6	10
THURSDAY	11		8	12	12		12		7	11
FRIDAY	12		9	13	13	II YR CRT TRAINING	13	II YR CRT TRAINING	8	12
SATURDAY	13		10	14	14		14		9	13
SUNDAY	14	HOLIDAY	11	15	15	HOLIDAY	15	HOLIDAY	10	14
MONDAY	15	IV-II COMMENCEMENT WORK	12	16	16	IV-II MID I EXAM	16	II & III-II MID I EXAM	11	15
TUESDAY	16		13	17	17	IV-II MID I EXAM & II YR TRAINING	17	II & III-II MID I EXAM, II YR TRAINING	12	16
WEDNESDAY	17		14	18	18	IV-II MID I EXAM	18	II & III-II MID I EXAM	13	17
THURSDAY	18		15	19	19	IV-II 2ND SPELL	19		14	18
FRIDAY	19		16	20	20	II YR CRT TRAINING	20	II-II & III-II/II SPELL INSTRUCTIONS	15	19
SATURDAY	20		17	21	21		21		16	20
SUNDAY	21	HOLIDAY	18	22	22	HOLIDAY	22	HOLIDAY	17	21
MONDAY	22		19	23	23		23		18	22
TUESDAY	23		20	24	24	SUBMISSION OF IV-II MID I MARKS, II YR TRAINING	24	SUBMISSION OF III-II MID I MARKS	19	23

WEDNESDAY	24		21		25		25		22		20		24	I-II & III-II SEM END EXAMS
THURSDAY	25	CHRISTMAS HOLIDAY	22		26		26		23		21		25	I-II & III-II SEM END EXAMS
FRIDAY	26	BOXING DAY HOLIDAY	23	AI CLUB MEETING	27	II YR CRT TRAINING	27	II YR TRAINING	24	II YR TRAINING	22	II YR TRAINING	26	MUHARRAM HOLIDAY
SATURDAY	27	DEPARTMENT MEETING	24		28	DEPARTMENT MEETING	28		25		23		27	I-II & III-II SEM END EXAMS
SUNDAY	28	HOLIDAY	25	HOLIDAY		HOLIDAY	29	HOLIDAY	26	HOLIDAY	24	HOLIDAY	28	HOLIDAY
MONDAY	29		26	REPUBLIC DAY			30		27		25		29	I-II & III-II SEM END EXAMS
TUESDAY	30		27	II& III YR CRT TRAINING			31	II YR TRAINING	28	II YR TRAINING	26	II YR TRAINING	30	I-II & III-II SEM END EXAMS
WEDNESDAY	31	AI CLUB MEETING	28	II& III YR CRT TRAINING					29	AI CLUB MEETING	27	BAKRID HOILDAY		
THURSDAY			29	II& III YR CRT TRAINING					30	IV-II MID II EXAMS	28			
FRIDAY			30	II& III YR CRT TRAINING							29	II YR TRAINING		
SATURDAY			31	II& III YR CRT TRAINING							30			
SUNDAY		HOLIDAY		HOLIDAY		HOLIDAY		HOLIDAY		HOLIDAY	31	HOLIDAY		HOLIDAY

HOD

PRINCIPAL

	Jul-26
1	I-II & III-II SEM END EXAMS
2	II-II & III-II SEM END EXAMS
3	II-II & III-II SEM END EXAMS
4	II-II & III-II SEM END EXAMS
5	HOUDAY
6	
7	
8	
9	
10	
11	DEPARTMENT MEETING
12	HOUDAY
13	
14	
15	
16	
17	
18	
19	HOUDAY
20	
21	

22	
23	
24	
25	
26	HOUDAY
27	
28	
29	
30	
31	
	HOUDAY

INSTITUTION ACADEMIC CALENDAR



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Sheriguda (V), Ibrahimpatnam, R.R. Dist, Hyderabad - 501 510

D4

ANNEXURE -III

BR-22

Lr.No.SICET/AUTO/DAE/II^o B.Tech Academic Calendar/30/2025

B.TECH II-YEAR I-SEM & II-SEM ACADEMIC CALENDAR (FOR ACADEMIC YEAR : 2025-26)

Academic Calendar for B.Tech – IInd Year Students (2024 - 25 Batch), BR-22 Regulation.

I – Semester

S.No.	EVENT	PERIOD	DURATION
1.	Commencement of class work.	01.08.2025 (Monday)	
2.	1 st Spell of Instructions for covering First Two and a half Units.	01.08.2025 – 07.10.2025	9 Weeks
3.	I Mid Term Examinations.	08.10.2025 – 10.10.2025	3 Days
4.	Submission of I Mid Term Examination Marks.	16.10.2025	
5.	2 nd Spell of Instructions for Remaining Two and a half Units.	13.10.2025 – 13.12.2025	9 Weeks
6.	II Mid Term Examinations.	15.12.2025 – 17.12.2025	3 Days
7.	Preparation Holidays and Practical Examinations	18.12.2025 – 27.12.2025	1 Week
8.	Submission of II Mid Term Examination Marks.	23.12.2025	
9.	I Semester End Examinations.	29.12.2025 – 10.01.2026	2 Weeks
Commencement of Class-Work for II B.Tech - II Semester 19.01.2026			

Note: No of Working/instructional days : 92

II – Semester

S.No.	EVENT	PERIOD	DURATION
1.	Commencement of class work.	19.01.2026 (Monday)	
2.	1 st Spell of Instructions for covering First Two and a half Units.	19.01.2026 – 14.03.2026	8 Weeks
3.	I Mid Term Examinations.	16.03.2026 – 18.03.2026	3 Days
4.	Submission of I Mid Term Examination Marks.	24.03.2026	
5.	2 nd Spell of Instructions for Remaining Two and a half Units.	20.03.2026 – 09.05.2026	7 Weeks
6.	Continuation of remaining 2 nd Spell of Instructions	25.05.2026 – 10.06.2026	2 Weeks
7.	II Mid Term Examinations.	11.06.2026 – 13.06.2026	3 Days
8.	Preparation Holidays and Project Evaluation.	15.06.2026 – 20.06.2026	1 Week
9.	Submission of II Mid Term Examination Marks.	18.06.2026	
10.	II Semester End Examinations	22.06.2026 – 04.07.2026	2 Weeks

Note: No of Working/instructional days : 92


ACE


CE


DIRECTOR


PRINCIPAL

Controller of Examination
Sri Indu College of Engineering & Technology
(An Autonomous Institution Under UGC)
Sheriguda (V), Ibrahimpatnam, R.R. Dist-501510.

Sign: 
Dr. M.V.S.S. Giridhar
Prof. of CEA; JNTUH Nominee

(Copy to DAP&E and Copy to all the Dept. Heads)

DIRECTOR
Sri Indu College of Engineering & Technology
(An Autonomous Institution Under UGC)
Sheriguda (V), Ibrahimpatnam, R.R. Dist-501510

Sign: 
Dr. T. Venu Gopal
Prof. of CSE; JNTUH Nominee

PRINCIPAL
Sri Indu College of Engineering & Technology
(An Autonomous Institution Under UGC)
Sheriguda (V), Ibrahimpatnam, R.R. Dist-501510.

Sign: 
Dr. D. Ramesh
Prof. of CSE; JNTUH Nominee

Subject: MATHEMATICAL AND STATISTICAL FOUNDATIONS

SYLLABUS

BR22 – B.TECH. –ARTIFICIAL INTELLIGENCE & DATA SCIENCE			
(An Autonomous Institution under UGC, New Delhi)			
B.Tech. - II Year – II Semester		L	T
		P	C
		3	0
		0	3
(R22MTH2215) MATHEMATICAL AND STATISTICAL FOUNDATIONS			
Course Objectives:			
• The Number Theory basic concepts useful for cryptography etc • The theory of Probability and probability distributions of single and multiple random variables • The sampling theory and testing of hypothesis and making inferences • Stochastic process and Markov chains.			
Course Outcomes: After learning the contents of this course, the student must be able to			
• Apply the number theory concepts to cryptography domain • Apply the concepts of probability and distributions to some case studies • Correlate the material of one unit to the material in other units • Resolve the potential misconceptions and hazards in each topic of study.			
UNIT-I : Greatest Common Divisors and Prime Factorization: Greatest common divisors, The Euclidean algorithm, The fundamental theorem of arithmetic, Factorization of integers and the Fermat numbers			
Congruences: Introduction to congruences, Linear congruences, The Chinese remainder theorem, Systems of linear congruences.			
UNIT-II : Random Variables and Probability Distributions: Concept of a Random Variable, Discrete Probability Distributions, Continuous Probability Distributions, Statistical Independence.			
Discrete Probability Distributions: Binomial Distribution, Poisson distribution.			
Continuous Probability Distributions: Normal Distribution, Areas under the Normal Curve, Applications of the Normal Distribution, Normal Approximation to the Binomial			
UNIT-III:			
Fundamental Sampling Distributions: Random Sampling, Sampling Distributions, Sampling Distribution of Means and the Central Limit Theorem, Sampling Distribution of S^2 , t-Distribution, F-Distribution.			
Estimation & Tests of Hypotheses: Introduction, Statistical Inference, Classical Methods of Estimation. Estimating the Mean, Standard Error of a Point Estimate, Prediction Intervals, Tolerance Limits, Estimating the Variance, Estimating a Proportion for single mean, Difference between Two Means, between Two Proportions for Two Samples and Maximum Likelihood Estimation.			
UNIT-IV : Correlation and Simple Linear Regression:			
Correlation, Rank Correlation. Introduction to Linear Regression, The Simple Linear Regression Model, Least Square method: Curve fitting by method of least squares, Fitting a straight line, Parabola and Exponential Curves, Properties of the Least Squares Estimators.			
UNIT-V: Stochastic Processes and Markov Chains: Introduction to Stochastic processes-Markov process, Transition Probability, Transition Probability Matrix, First order and Higher order Markov process, n-step transition probabilities, Markov chain, Steady state condition, Markov analysis.			
TEXTBOOKS:			
1. Kenneth H. Rosen, Elementary number theory & its applications, sixth edition, Addison-Wesley, ISBN 978 0-321-50031-1			
2. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Keying Ye, Probability &			
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3. S. D.Sharma,OperationsResearch,KedarnathandRamnathPublishers,Meerut, Delhi

REFERENCEBOOK:

1. S CG uptaandVK Kapoor,Fundamentals of Mathematical statistics,Khanna publications
 2. T.T. Soong, Fundamentals of Probability And Statistics For Engineers, John Wiley & SonsLtd,2004.
- Sheldon MRoss,Probability and statistics for Engineers and scientists,Academic Press.

J.S. Adh

	SRIINDUCOLLEGE OFENGINEERING&TECHNOLOGY			Prepared on 2026
	LESSON PLAN (Regulation :R22) Department of AIML			
	Sub.Code& Title	(R22MTH2215)MathematicalandStatisticalFoundations		
	AcademicYear:2025-26	Year/Sem./Section	II/I-SEM-AIML	
FacultyName&Designation	Dr. AadilHamid,Assistant.Professor			

Unit/Item No.	Topic(s)	Book Reference	Page(s)		Teaching Methodology	Proposed No. of Periods	ActualDate ofHandled	CO/RBT
			From	To				
	UNIT– I							
I	GreatestCommonDivisorsandPrimeFactorization:					11		
1.1	Greatestcommondivisors	T1	53	55	Blackboard	01		CO-1,k5
1.2	TheEuclideanalgorithm	T1	55	59	Blackboard	01		CO-1,k3
1.3	Thefundamentaltheoremof arithmetic	T1	60	62	Blackboard	01		CO-1,k3
1.5	Factorizationofintegers	T1	65	70	Blackboard	01		CO-1,k5
1.6	TheFermatnumbers	T1	82	85	Blackboard	01		CO-1,k1
1.7	Introductiontocongruences	T1	91	96	Blackboard	01		CO-1,k2
1.8	Linearcongruences	T1	97	101	Blackboard	01		CO-1,k1
1.9	TheChineseremainder theorem,	T1	102	103	Presentation	01		CO-1,k4
1.10	Systemsoflinearcongruences	W1			Presentation	01		CO1,k3
1.11	Problems on congruence	W2			Presentation	01		CO1,k5
		SignatureoftheHOD/Coordinator						

UNIT-II								
Random Variables and Probability								
2.1	Random Variables	T3	1	3	Blackboard	01		CO2,k1
2.2	Probability Distributions	T3	10	15	Demonstration	01		CO2,k2
2.3	Concept of a Random Variable	T3	16	22	Blackboard	01		CO2,k2
2.4	Discrete Probability Distributions	T3	24	26	Blackboard	01		CO2,k5
2.5	Problems on discrete probability distributions	T3	28	35	Blackboard	01		CO2,k5
2.6	Continuous Probability Distributions	T3	36	37	Blackboard	01		CO2,k4
2.7	Problems on Continuous Probability Distributions	T3	38	50	Blackboard	01		CO2,k5
2.8	Statistical Independence	T1	36	36	Blackboard	01		CO2,k1
2.9	Binomial Distribution	T3	121	140	Blackboard	01		CO2,k1
2.10	Poisson distribution.	T3	141	165	Blackboard	01		CO2,k1
2.11	Normal Distribution	T3	166	167	Presentation	01		CO2, K2
2.12	Area under the Normal Curve	T3	168	168	Presentation	01		CO2, K3
2.13	Applications of the Normal Distribution	W4	170	174	Blackboard	01		CO2, K3
2.14	Problems on the Normal Distribution	T1	50	65	Blackboard	01		CO2, K5
2.15	Fundamental Sampling Distributions	T1	65	75	Blackboard	01		CO2, K4
		Signature of the HOD/Coordinator						
UNIT-III								
III	Fundamental Sampling Distributions					11		
3.1	Fundamental Sampling Distributions	T1	89	90	Blackboard	01		CO3,k4
3.2	Random Sampling,	T1	91	95	Blackboard	01		CO3,k2
3.3	Sampling Distribution of Means and the Central Limit Theorem	T1	100	126	Blackboard	01		CO3,k5
3.4	Sampling Distribution of chi-square test	T2	4.5	4.25	Blackboard	01		CO3,k3
3.5	Sampling Distribution of t-test	T2	4.26	4.30	Blackboard	01		CO3,k4
3.6	Sampling Distribution of F-test	T2	4.45	4.50	Blackboard	01		CO3,k3
3.7	Introduction Estimation & Tests of Hypotheses:	T1	250	251	Presentation	01		CO4,k3
3.8	Classical Methods of Estimation.	T1	253	253	Presentation	01		CO4,k4
3.9	Estimating the Mean	T1	254	255	Blackboard	01		CO4,k1
3.10	Standard Error of a Point Estimate	T1	260	269	Blackboard	01		CO4,k4
3.11	Prediction Intervals,	R1	4.61	4.72	Presentation	01		CO4,k5

3.12	EstimatingtheVariance,	R1	4.73	4.80	Presentation	01		CO4,k5
3.13	EstimatingaProportionforsinglemean	T1	280	290	Blackboard	01		CO4,k4
3.14	Estimating DifferencebetweenTwoMeans	T1	300	304	Blackboard	01		CO4,k4
3.15	EstimatingDifferencebetweenTwo proportion	T3	5.4	5.14	Blackboard	01		CO4,k4
3.16	MaximumLikelihoodEstimation.	T3	5.24	5.40	Blackboard	01		CO4,k1
		SignatureoftheHOD/Coordinator						
UNIT-IV								
IV	SimpleLinearRegressionandCorrelation					08		
4.1	IntroductiontoLinearRegression	T2	357	357	Blackboard	01		CO5,k2
4.2	TheSimpleLinearRegressionModel	T2	358	358	Blackboard	01		CO5,k1
4.3	LeastSquaresandtheFittedModel	T2	358	359	Blackboard	01		CO5,k5
4.4	PropertiesoftheLeastSquaresEstimators	T2	360	361	Demonstration	01		CO5,k4
4.5	InferencesConcerningtheRegression Coefficients	T2	362	367	Blackboard	01		CO5,k1
4.6	Introductiontocurvefitting	T2	5.0	5.1	Blackboard	01		CO5,k2
4.7	Methodofleastsquaremethods	T2	5.1	5.2	Blackboard	01		CO5,k1
4.8	Fittingastraightline	T2	5.3	5.5	Blackboard	01		CO5,k2
4.9	Seconddegreeparabola	T2	5.6	5.7	Blackboard	01		CO5,k3
4.10	ExponentialCurves	T2	5.8	5.11	Blackboard	01		CO5,k1
		SignatureoftheHOD/Coordinator						
	UNIT-V							
V	StochasticProcessesandMarkovChains					08		
5.1	IntroductiontoStochasticprocesses- Markovprocess	R1	8.1	8.2	Blackboard	01		CO6,k1
5.2	TransitionProbability	R1	8.2	8.7	Blackboard	01		CO6,k2
5.3	TransitionProbabilityMatrix,	R1	8.7	8.36	Blackboard	01		CO6,k5
5.4	FirstorderandHigherorderMarkov process	R1	8.2	8.36	Blackboard	01		CO6,k4
5.5	n-steptransitionprobabilities	R1	8.25	8.27	Blackboard	01		CO6,k4
5.6	Markovchain,	R1	8.01	8.22	Blackboard	01		CO6,k3
5.7	Steadystate condition,	R1	8.31	8.38	Blackboard	01		CO6,k1
5.8	Markovanalysis	R1	8.39	8.46	Blackboard	01		CO6,k4
		SignatureoftheHOD/Coordinator						-

	SRIINDUCOLLEGE OF ENGG & TECH (Regulation: R22)			Page(s):
	Department of CSE (ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)			
	Sub.Code & Title		(R22MTH2215) Mathematical and Statistical Foundations	
	Academic Year: 2025-26		Year/Sem./Section	II/II: AIML
Faculty Name & Designation		Dr. Aadil Hamid, Assistant Professor		

LEARNING RESOURCES:

1. TEXTBOOKS:

- T1: Kenneth H. Rosen, Elementary number theory & its applications, sixth edition, Addison-Wesley, ISBN 9780-321-50031-1
- T2: Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Keying Ye, Probability & Statistics for Engineers & Scientists, 9th Ed. Pearson Publishers.
- T3: SC Gupta and VK Kapoor, Fundamentals of Mathematical statistics, Khanna Publications Ltd, 2004.

2. REFERENCE BOOK:

R1: Sheldon M Ross, Probability and statistics for Engineers and scientists, Academic Press.

3. E-Text Books: 1. <https://www.e-booksdirectory.com/details.php?ebook=10166>

4. MOOCS Course:

1. <https://swayam.gov.in/>
2. <https://onlinecourses.nptel.ac.in/>

5. WEB RESOURCES:

This course uses exclusively for providing electronic resource, such as lecturer notes, assignment papers, and sample solutions. Students should make appropriate use of this resource

1. [https://eng.libretexts.org/Bookshelves/Computer_Science/Programming_and_Computation_Fundamentals/Mathematics_for_Computer_Science_\(Lehman_Leighton_and_Meyer\)/02%3A_Structures/08%3A_Number_Theory/8.02%3A_The_Greatest_Common_Divisor](https://eng.libretexts.org/Bookshelves/Computer_Science/Programming_and_Computation_Fundamentals/Mathematics_for_Computer_Science_(Lehman_Leighton_and_Meyer)/02%3A_Structures/08%3A_Number_Theory/8.02%3A_The_Greatest_Common_Divisor)
2. <https://www.studocu.com/in/document/cochin-university-of-science-and-technology/btech-computer-science-engineering/congruence-relation/30273245>
3. <https://www.analyticssteps.com/blogs/simple-linear-regression-applications-limitations-examples>

4. <https://study.com/academy/lesson/the-correlation-coefficient-definition-formula-example.html>
5. https://www.iitp.ac.in/~sourav/CS244_2022/7.Continuous-Probability-distribution.pdf
6. https://onlinecourses.nptel.ac.in/noc19_ma30/preview
7. <https://swayam.gov.in/>
8. <https://onlinecourses.nptel.ac.in/>

6. Mathematics Websites: The following information on the Mathematics Websites will be an additional source of information for references and historical development of the Mathematics. Some biographies of outstanding mathematicians are also available.

1. <http://scienceworld.wolfram.com/biography/topics/Mathematicians.html>
2. <http://teachers.sduhsd.k12.ca.us/abrown/index2.html>
3. <http://www.maths.tcd.ie/pub/HistMath/People/RBallHist.html> Mathematicians of the 17th and 18th Centuries
4. <http://www.geometry.net/math.html> A Geometry Site
5. http://www.history.mcs.st-andrews.ac.uk/history/Indexes/Full_Alph.html Site of Biographies of Mathematicians

6. <http://mathforum.org>

This site includes resources in mathematics for school students, teachers, parents. Also contains some research related material on mathematics teaching and learning. The 'Problems of the Week' contains problems at different levels of mathematics. It includes selected alternative solutions posted by problem solvers which is really nice. The 'Ask Dr. Math' gives useful explanations of math concepts and the discussion groups are about teaching methods.

7. <http://www.cut-the-knot.org>

Contains interesting puzzles, problems, theorems, proofs, etc. Also has links to other good sites (including all those listed below).

8. <http://nrich.maths.org>

This site is run by the University of Cambridge. It contains problems for different age groups (5 to 18) that one can post solutions to. Selected solutions are published at the website. One can also post questions. There is an archive of questions posted earlier with answers (in blue coloured font). There are also articles, features, etc.

9. <http://archives.math.utk.edu/>

A fairly comprehensive archive: contains teaching materials, public domain software, shareware, books, articles, etc.

10. <http://www-groups.dcs.st-and.ac.uk/~history/>

The MacTutor history of mathematics archive. The best known website for historical information about mathematicians and mathematics.

11. <http://www.maa.org/>

This is the website of the Mathematical Association of America. Contains useful resources for college mathematics teachers including book reviews.

12. <http://e-math.ams.org/>

Website of the main professional organization in mathematics: American Mathematical Society. The journal 'Notices of the AMS' is online. Plus interesting essays.

7. Recommended Resources:

1. Applied Mathematics, Vol. I & II, P. N. Wartikar and J. N. Wartikar, Vidyarthi Prakashan.
2. A first course in Probability, S. M. Ross, Prentice Hall.
3. Probability and Statistics for Engineers, (Fourth Edition), I. R. Miller, J. E. Freund and R. Johnson, PHI.
4. Introduction to the Theory of Statistics, A. M. Mood, F. A. Graybill and D. C. Boes, McGraw Hill Education.
5. Advanced Engineering Mathematics, (Seventh Edition), Peter V. O'Neil, Thomson Learning
6. Probability and Statistics with Examples using R. Author: Siva Athreya, Deepayan Sarkar and Steve Tanner

	SRIINDU COLLEGE OF ENGINEERING & TECHNOLOGY (Regulation: R22) Department of CSE (COMMON TOPICS, CS, AI&ML, AI&DS)		Prepared on Rev1:
	Sub.Code & Title	(R22MTH2215) MATHEMATICAL STATISTICAL AND FOUNDATION	
	Academic Year: 2025-26	Year/Sem./Section	II-II-AIML
	Faculty Name & Designation	Dr. Aadil Hamid, Asst. Professor	

QUESTIONS WITH BLOOMSTAXONOMY LEVEL (BTL)

(1. Remembering 2. Understanding 3. Applying 4. Analyzing 5. Evaluating 6. Creating)

UNIT-IGREATEST COMMON DIVISORS AND PRIME FACTORIZATION

DESCRIPTIVE QUESTIONS			
1D1	What is the greatest common divisor (gcd) of 143, 227.	V	CO1
1D2	. Find the gcd of 42823 and 6409 using Euclidean algorithm	III	CO1
1D3	. Find the prime factorization of 7007	I	CO1
1D4	What is the least common multiple (lcm) of 732253 and 3234	II	CO1
1D5	Find the GCD of 45 and 126 and express it in the form $45x + 126y$ where x and y are integers.	I	CO1
1D6	If $a = -308$ and $b = 136$. Find GCD of a and b and express GCD(a, b) in the form of $ax + by$.	VI	CO1
1D7	Compute GCD(858, 728, 325).	I	CO1
1D8	Use prime factorization to find GCD and LCM of 2520, 4950.	IV	CO1
1D9	Use prime factorization to find GCD and LCM of 81, 100, 289.	I	CO1
1D10	Find the number of divisors and the sum of divisors for i) 18375. ii) 3625	I	CO1
1D11	Find the greatest common divisor (GCD) of 414 and 662 using Euclidean Algorithm	III	CO1
1D12	Express greatest common divisor (GCD) of (252, 198) = 18 as a linear combination of 252 and 198 using the Extended Euclidean Algorithm (E.E.A)	II	CO1
1D13	Solve the linear congruence i) $4x \equiv 8 \pmod{24}$. ii) $15x \equiv 12 \pmod{21}$.	II	CO1
1D14	. What is the general form of a Division Algorithm	II	CO1
1D15	What is the general form of Fermat's little theorem	II	CO1

Multiple Choice Questions

1C1	The sum and product of two even integers is _____ integer. A) odd B) even	II	CO2
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	C) both D) None		
1C2	The Greatest common divisor is _____ A) different A) positive B) unique C) None	II	CO2
1C3	Find the GCD of 56 and 72. A) 8 B) -5 C) 4 D) $\frac{1}{2}$	I	CO2
1C4	GCD(-a,b)= _____ A) GCD(a/b) B) LCM(-a,-b) C) GCD(-a,-b) D) None	I	CO2
1C5	Find integers x and y such that $256x + 116y = 4$. _____ A) $x=5, y=-11$ B) $x=9, y=3$ C) $x=5, y=-2$ D) $x=6, y=-11$.	I	CO2
1C6	Assume a and b are relatively prime then a and b have _____ A) No common divisor B) Common divisor C) 1 D) None	IV	CO2
1C7	Simplify $\text{GCD}(a,b) \times \text{LCM}(a,b) =$ _____ A) a/b B) $a+b$ C) $a-b$ D) ab	IV	CO2
1C8	If $d = \text{GCD}(a,b)$ then numbers $x, y \in \mathbb{Z}$ such that $d = ax + by$ are _____ A) unique B) Not unique C) different D) None	III	CO2
1C9	If x is any integer then Solve $\text{GCD}(a,b) =$ _____ A) $\text{GCD}(a, b+ax)$ B) $\text{LCM}(a, bx)$ C) $\text{GCD}(ax, b)$ D) $\text{GCD}(a+x, b-x)$.	VI	CO2
1C10	If $\text{gcd}(a,b)=1$ then a and b are relatively _____ A) unique B) Composite C) Prime D) Uniform distributed	I	CO2
1C11	Two integers a and b are congruent modulo m, if they leave same _____ when divided by m A) Quotient B) Divisor C) Remainder D) Dividend.	III	CO2
1C12	A polynomial congruence of first degree is called as _____ congruence A) Linear B) Quadratic C) Tetra D) None	IV	CO2
1C13	Any value of x which is the solution of congruence $ax \equiv 1 \pmod{m}$ is called as of modulo m. a) inverse	I	CO2

	b) opposite c) multiple d) None		
1C14	The Chinese remainder theorem is used to solve a system of linear congruences with how many variables? a) 3 b) 1 c) 5 d) 0	I	CO2
1C15	If p is prime and 'a' is an integer, then illustrate $a^p \equiv$ _____ a) $a \pmod{p}$ b) $p \pmod{a}$ c) p^a d) None	II	CO2
FILL IN THE BLANKS			
1F1	If $a \in \mathbb{Z}$ and $2 a$ then 'a' is called as _____	I	CO2
1F2	Evaluate $\text{GCD}(a, b) =$ _____	V	CO2
1F3	Determine $\text{GCD}(15, 12)$ in $ax + by$ form = _____	VI	CO2
1F4	Sum of two odd integers is an _____	I	CO2
1F5	If $\text{GCD}(a, b) = 1$ then a and b are relatively prime.	I	CO2
1F6	Simplify $\text{LCM}(6, 9) =$ _____	III	CO2
1F7	Assume $n > 1$ is a composite integer number then there exists prime p such that _____	IV	CO2
1F8	$a \equiv b \pmod{m}$ is interpreted as _____	II	CO2
1F9	Demonstrate the Reflexive property of congruence is _____	II	CO2
1F10	Symmetric property of congruence is _____	I	CO2
1F11	Solve, if $a \equiv b \pmod{m}$ and c is any integer then $(a + c) \equiv$ _____	III	CO2
1F12	A polynomial congruence of first degree is called as _____	I	CO3
1F13	Apply _____ Theorem to solve system of linear congruence with one variable but different moduli that are prime.	III	CO3
1F14	Demonstrate the symbol used to represent a Fermat Number _____	II	CO3
1F15	Find the first Fermat Number is _____	I	CO3

MATCH THE FOLLOWING												
1M1	<table><tr><td>I) If a=0,GCD(a,b) is</td><td>A)Greatestcommon divisor</td></tr><tr><td>II) GCD</td><td>B)LCM(-a,b)</td></tr><tr><td>III) GCD(a,a)=</td><td>C) b </td></tr><tr><td>IV) LCM(a,b)=</td><td>D) a </td></tr></table>		I) If a=0,GCD(a,b) is	A)Greatestcommon divisor	II) GCD	B)LCM(-a,b)	III) GCD(a,a)=	C) b	IV) LCM(a,b)=	D) a	II	CO2
	I) If a=0,GCD(a,b) is	A)Greatestcommon divisor										
	II) GCD	B)LCM(-a,b)										
	III) GCD(a,a)=	C) b										
IV) LCM(a,b)=	D) a											

1M2	I) $\text{GCD}(a,b) \times \text{LCM}(a,b) =$	A) Linear congruence	II	CO2
	II) $ax \equiv b \pmod{m}$	B) $ ab $		
	III) Fermat Number	C) Fermat primes		
	D) F_0, F_1 are	E) F_n		
1M3	i) Reflexive	a) $a \equiv a \pmod{m}$	II	CO2
	ii) Symmetric	b) $a \equiv b \pmod{m}$ and $b \equiv a \pmod{m}$ then $a \equiv c \pmod{m}$		
	iii) Transitive	c) $a \equiv b \pmod{m}$ then $b \equiv a \pmod{m}$		
	iv) Distributive	d) $a.(b+c) = a.b + a.c$		
1M4	1) GCD	a) Self-inverse	II	CO3
	2) LCM	b) Greatest Common Divisor		
	3) If $p = 2^n - 1$ then	c) Prime		
	4) If $a^2 \equiv 1 \pmod{m}$, then Inverse of a	d) Least Common Multiple		

UNIT 2: RANDOM VARIABLES AND PROBABILITY DISTRIBUTIONS

MULTIPLE CHOICE QUESTIONS

2C1	If X is a random variable such that $E(X) = 3$ and $E(X^2) = 13$. Illustrate the probability theorem is _____ A) $\frac{25}{4}$ B) $\frac{4}{25}$ C) $\frac{25}{21}$ D) None	II	CO2
2C2	$E(KX) =$ A) $KE(X)$ B) $K^2E(X)$ C) $E(X)$ D) None	II	CO2

2C3	define $\text{Var}(K+X)=$ E) $\text{Var}(K)$ F) $K+\text{Var}(X)$ G) $K^2\text{Var}(X)$ H) None	I	CO2
2C4	Identify Mean of the binomial distribution _____ E) np F) npq G) p^2q H) None	III	CO2
2C5	Illustrate Variance of the binomial distribution is _____ E) np F) npq G) nq H) None	II	CO2
2C6	If the probability density of a random variable is given by $f(x) = \begin{cases} kx, & 0 \leq x \leq 1 \\ 0, & \text{otherwise} \end{cases}$ Then solve the value of k = _____ E) 1 F) 2 G) 3 H) 4	VI	CO2
2C7	Choose Mean of the Poisson distribution is _____ E) λ F) λ^2 G) λ^3 H) None	V	CO2
2C8	Solve the mode of the binomial distribution for which the mean is 4 and variance 3 is _____ E) 2 F) 4 G) 8 H) 3	III	CO2
2C9	The mean of the probability distribution of the number of heads obtained in two flips of a balanced coin is a _____ E) 1 F) 0 G) 2 H) 3	II	CO2
2C10	The distribution in which mean is equal to the variance is _____ E) Binomial distribution F) Poisson distribution G) Normal distribution H) Uniform distribution	I	CO2
2C11	If mean = 5, variance = $\frac{10}{3}$ of a binomial distribution, then solve n = _____ E) 0 F) 3 G) 5 H) 7	III	CO2
2C12	If X is Poisson distribution such that $\mu = 2$, Simplify $P(X=1) =$ _____ E) 0.9 F) 0.27 G) 0.36 H) 0.4	IV	CO2

2C13	What is the Total area under the standard normal curve is equal to _____? e) 0 f) 1 g) 2 h) ∞	I	CO2
2C14	If X is standard variate, interpret $P(0 \leq Z \leq 1.2) =$ _____ e) 0.3849 f) 0.21 g) 0.48 h) 0.57	II	CO2
2C15	The distribution in which mean, median and mode coincide is _____ e) Binomial f) Poisson g) Normal h) Uniform	IV	CO2

FILL IN THE BLANKS

2F1	If k is constant then $\text{var}(k) =$ _____	II	CO2
2F2	If X is a random variable and $V(X) = 2$ then $V(2X + 3) =$ _____	II	CO2
2F3	If X is uniformly distributed in $[a, b]$ then $E(X) =$ _____	I	CO2
2F4	Maximum value of probability is _____	VI	CO2
2F5	Mean and variance in a Poisson distribution are _____	III	CO2
2F6	A coin is tossed 7 times. The mode of distribution of getting heads is _____	I	CO2
2F7	In a binomial distribution mean is 48 and the SD is 4 then $p =$ _____	II	CO2
2F8	In a Poisson distribution $P(X=0) = 0.2$ then $V(x) =$ _____	II	CO2
2F9	If a card of spades is drawn from a pack of 52 well shuffled cards once in 104 trials, then the mean is _____	IV	CO2
2F10	The mean of the distribution of getting heads in tossing a coin 5 times is _____	IV	CO2
2F11	If x is Poisson variate such that $E(x^2) = 6$, then $E(x) =$ _____	II	CO2
2F12	If $\mu = 5$ and $\sigma = 2$ write the equation of the normal distribution is _____	I	CO3
2F13	Asymptote to the curve of normal distribution is _____	I	CO3
2F14	Write the mean, median, mode of a normal distribution are _____	II	CO3
2F15	Determine Area under the whole normal curve is _____	V	CO3

MATCH THE FOLLOWING

2M1	V) If X is a random variable then $V(aX+b)$	E) $aE(x)+b$	II	CO2
	VI) $V(a)$	F) $a^2V(x)$		
	VII) $E(ax+b)$	G) 1		
	VIII) $\sum_{i=1}^n P(x_i)$	H) 0		
2M2	IV) $P(X=r)$	F) np	I	CO2
	V) $E(1)$	G) $nC_r(p^r)q^{n-r}$		
	VI) Mean of binomial distribution	H) npq		
	VII) Variance of binomial distribution	I) 1		
2M3	v) $P(X < x)$	e) $1 - P(X > x)$	III	CO2
	vi) $P(X > x)$	f) $1 - P(X < x)$		
	vii) $P(X \leq x)$	g) $1 - P(X \geq x)$		
	viii) $P(X \geq x)$	h) $1 - P(X \leq x)$		
2M4	5) Mean of normal distribution	e) Standard normal distribution	I	CO3
	6) Median of normal distribution	f) λ		
	7) The normal distribution with mean $\mu = 0$ and standard deviation $\sigma = 1$	g) $\mu = b$		
	8) Mean of the exponential distribution	h) $\mu = M$		

DESCRIPTIVE QUESTIONS

2D1	A random variable X has the following probability distribution								V	CO2
	X	1	2	3	4	5	6	7	8	
	P(X)	K	2K	3K	4K	5K	6K	7K	8K	
	Evaluate the value of a) K b) $P(X \leq 2)$ c) $P(2 \leq X \leq 5)$									
2D2	Let X denote the minimum of the two numbers that appear when a pair of each fair dice is thrown once. Determine the a) discrete probability function b) expectation c) variance								III	CO2
2D3	A random variable X has the following probability function Find i) K ii) Mean iii) variance								I	CO2
	X	-3	-2	-1	0	1	2	3		
	P(X)	K	0.1	K	0.2	2K	0.4	2K		

2D4	If the probability density of a random variable is given by $f(x)$ $= \begin{cases} k(1 - x^2), & \text{for } 0 < x < 1 \\ 0, & \text{otherwise} \end{cases}$ Find the value of k and the probabilities that a random variable having this probability density will take on a value i) between 0.1 and 0.2 ii) greater than 0.5.	I	CO2														
2D5	A fair die is tossed. Let the random variable X denote the number appearing on the die. Write the distribution of X , Find the (i) mean (ii) variance (iii) standard deviation	I	CO2														
2D6	Derive variance of binomial distribution.	IV	CO2														
2D7	20% of items produced from a factory are defective. Find the probability that in a sample of 5 chosen at random i) none is defective ii) one is defective iii) $P(1 < x < 4)$	I	CO2														
2D8	Derive mean of Poisson distribution	III	CO2														
2D9	Given that $P(X=2)=9P(X=4)+90P(X=6)$ for a Poisson variate X . find i) $P(X < 2)$ ii) $P(X > 4)$ iii) $P(X \geq 1)$	II	CO2														
2D10	Average number of accidents on any day on a national highway is 1.8. Illustrate the probability that the number of accidents are i) at least one ii) at most one.	II	CO2														
2D11	Fit a Poisson distribution to the following data <table><tr><td>x</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr><tr><td>y</td><td>42</td><td>33</td><td>14</td><td>6</td><td>4</td><td>1</td></tr></table>	x	0	1	2	3	4	5	y	42	33	14	6	4	1	II	CO2
x	0	1	2	3	4	5											
y	42	33	14	6	4	1											
2D12	Fit a binomial distribution to the following data <table><tr><td>X</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td></tr><tr><td>F</td><td>38</td><td>144</td><td>342</td><td>287</td><td>164</td></tr></table>	X	0	1	2	3	4	F	38	144	342	287	164	II	CO2		
X	0	1	2	3	4												
F	38	144	342	287	164												
2D13	In a Normal distribution 7% of the items are under 35 and 89% are under 63. Determine the mean and variance of the distribution.	V	CO2														
2D14	The mean and standard deviation of a normal variable are 8 and 4 respectively find i) $P(5 \leq X \leq 10)$ ii) $P(X \geq 5)$	V	CO2														
2D15	If X is a normal variate, find the area A I. to the left of $z = -1.78$ II. to the right of $z = -1.45$ III. Corresponding to $-0.8 \leq z \leq 1.53$ IV. to the left of $z = -2.52$ and to the right of $z = 1.83$	I	CO2														

UNIT-III-FUNDAMENTALSAMPLINGDISTRIBUTIONS.

S.NO	MULTIPLECHOICEQUESTIONS	BT LEVELS	COURSE OUTCOMES
3C1	Illustratethestandarderrorofthestatisticsamplemean($\bar{X}$)is_____ a) $\frac{\sigma}{\sqrt{n}}$ b) $\frac{\sigma^2}{\sqrt{n}}$ c) $\sqrt{\frac{\sigma}{n}}$ d) none	II	CO3
3C2	Choosetheprobabilityofincludinga specifiedunit oriteminasampleofsize n selected out of N units is _____ a) $\frac{1}{N}$ b) N^n c) NC_n d) <i>None</i>	VI	CO3
3C3	Definethestatisticalconstantsofthepopulationarecalled_____ a) Statistic b) Parameter c) Samplestatistic d) none	I	CO3
3C4	Whatisthenumber ofpossiblesamplesofsize n fromapopulation of N unitswith replacement is_____? a) N^n b) NC_n c) $\frac{1}{NC_n}$ d) <i>none</i>	I	CO3
3C5	ChooseThefinitepopulationcorrectionfactoris_____ a) $\frac{N-n}{N-1}$ b) $\sqrt{\frac{N-n}{N-1}}$ c) $\frac{N-1}{N-n}$ d) $\sqrt{\frac{N-1}{N-n}}$	VI	CO3
3C6	If $x_1, x_2, x_3, \dots, x_n$ constitutearandomsamplefromaninfinitepopulationwith mean μ and variance σ^2 then interpret $\mu_{\bar{x}}=$ _____and $\sigma_{\bar{x}}^2=$ _____ a) $\mu, \frac{\sigma^2}{n}$ b) μ, σ^2 c) $\mu, \frac{\sigma^2}{N-n}$ d) <i>None</i>	V	CO3

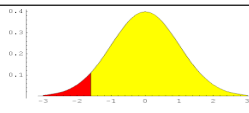
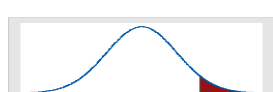
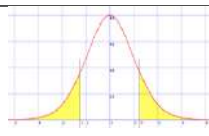
3C7	The method to determine an unknown population parameter is known as _____ a) Estimator b) Estimate c) Hypothesis testing d) Estimation	VI	CO4
3C8	Formulate the Maximum error of estimate E with $(1-\alpha)$ probability is _____ a) $z_{\alpha/2} \frac{\sigma}{\sqrt{n}}$ b) $z_{\alpha/2} \frac{\sigma}{\sqrt{n}}$ c) $z_{\alpha/2} \frac{\sigma}{\sqrt{n}}$ d) $z_{\alpha/2} \frac{\sigma}{\sqrt{n}}$	V	CO4
3C9	Choose the Types of estimation to determine the statistic of the population parameters _____ a) Biased and unbiased estimation b) Variance and point estimation c) Point and interval estimation d) Mean and interval estimation	I	CO4
3C10	A hypothesis is true but is rejected; this is an error of type is defined as _____ a) I b) II c) I and II d) None	V	CO4
3C11	In a city 250 men out of 750 men were found to be smokers; the test statistic evaluate $z =$ _____ a) 2.25 b) 2.5 c) 5.25 d) 5.50	VI	CO4
3C12	formulate $t_{1-\alpha} =$ _____ a) t_{α} b) $-t_{\alpha}$ c) $t_{\alpha-1}$ d) none	III	CO4
3C13	Choose the shape of t-distribution is similar to that of _____ a) chi-squared distribution b) F-distribution c) Normal distribution d) none	I	CO4
3C14	Which distribution is used to test the equality of population means _____ a) chi-squared distribution b) F-distribution c) t-distribution d) none	II	CO4
3C15	If $n=100, \sigma=5$ then illustrate the maximum error with 95% confidence is _____ a) 0.98 b) 1.2875 c) 3.92 d) 1.16	I	CO4

FILL IN THE BLANKS

3F1	Define The probability distribution of a statistic is called _____	I	CO3
3F2	If $\bar{X}=157, \mu=155, \sigma=15$ and $n=36$ then solve Z is _____	III	CO3
3F3	Analyze is The finite population correction factor is _____	IV	CO3
3F4	Define The standard error of the statistics sample mean ($\bar{X}$) is _____	I	CO3
3F5	Solve $P(Z > 1.76) =$ _____	III	CO3
3F6	If the size of the sample is 5 and size of the population is 2000, Then Find correction factor is _____	I	CO3
3F7	Estimate A coin is tossed 3 times, the probability of obtaining two heads will be _____	VI	CO3
3F8	If $n=144, \sigma=4$ and $x=150$ then examine 95% confidence interval for mean is _____	IV	CO3
3F9	A hypothesis is false but accepted this is an error of the type _____	I	CO4
3F10	What is The main use of F-test is _____	I	CO4
3F11	Develop A random variable X has the same distribution with _____ degree of freedom	VI	CO4
3F12	If two independent random sample of size $n_1=13$ and $n_2=7$ are taken from a normal population the variance of the first sample will be at least 4 times as that of a second sample then F is _____	II	CO4
3F13	A random sample of 400 products contain 52 defective items standard error of proportion is _____	II	CO4
3F14	If $\bar{X}=47.5, \mu=42.1, S=8.4$ and $n=25$ then illustrate $t =$ _____	III	CO4
3F15	Two types of hypothesis are _____ and _____	I	CO4

MATCH THE FOLLOWING

MATCH THE FOLLOWING				
3M1	A) Any statistical measure computed from population data is	i) statistic	II	CO3
	B) Any statistical measure computed from sampled data	ii) size of the population		
	C) A random variable that is calculated from the sample	iii) parameter		
	D) The number of observations in the population	iv) population distribution		

3M2	A) The difference between a statistic and the parameter is a	i)population	I	CO3
	B) Sample is regarded as subset of	ii)0.9		
	C) The difference between the expected value of a statistic & the value of the parameter being estimated is called as	iii)Bias		
	D) The finite population correction factor for $n=1000$ and $N=10000$ is	iv)sampling error		
3M3	A) when null hypothesis is accepted, result is said to be	i)Type II	I	CO4
	B) level of significance of a test denoted by α is the probability of committing error	ii)reduced		
	C) when the size of the sample space is increased , the probability of committing both types of errors can be _____ simultaneously	iii) Non – significant		
	D) when null hypothesis is rejected, result is said to be	iv)Type I		
3M4	i) Rightsided tail		II	CO4
	ii) Twosided tail			
	iii) Leftsided tail			

DESCRIPTIVE QUESTIONS

3D1	A random sample of size 100 is taken from an infinite population having the mean $\mu=76$ and variance 256. What is the probability that $\bar{x}$ will be between 75 and 78.	I	CO3
3D2	A population consists of six numbers 4, 8, 12, 16, 20, 24. Consider all samples of size two which can be drawn without replacement from this population. Illustrate - The population mean. - The population standard deviation. - The mean of the sampling distribution of means. - The standard deviation of the sampling distribution of means.	II	CO3
3D3	Explain briefly chi-square distribution.	IV	CO3
3D4	A random variance of size 16 values from a normal population showed a mean of 53 and a sum of squares of deviations from the mean equals to 150. Can this sample be regarded as taken from the population having 56 as mean? Obtain 95% confidence limits of the mean of the population?	I	CO3

3D5	A population consists of 5, 10, 14, 18, 13, 24. Consider all possible samples of size two which can be drawn without replacement from the population. Find a) The mean of the population b) The standard deviation of the population. C) The mean of the sampling distribution of means and d) The standard deviation of the sampling distribution of means	II	CO3																		
3D6	A normal population has a mean of 0.1 and standard deviation of 2.1. Find the probability that mean of a sample of size 900 will be negative?	II	CO3																		
3D7	A random sample of size 64 is taken from an infinite population having the mean $\mu = 51.4$ and standard deviation $\sigma = 68$. What is the probability that the mean of the sample will a) exceed 52.9 b) fall between 50.5 and 52.3 c) less than 50.6.	I	CO3																		
3D8	In a random sample of 100 packages shipped by air freight 13 had some damage. Determine the standard error of proportions.	VI	CO3																		
3D9	Explain the procedure of testing of hypothesis.	II	CO4																		
3D10	A sample of 400 items is taken from a population whose standard deviation is 10. The mean of the sample is 40. Test whether the sample has come from a population with mean 38. Also calculate 95% confidence interval for the population	VI	CO4																		
3D11	The samples of students were drawn from two universities and from their weights in kilograms, means and standard deviations are calculated below. Make a large sample test to test the significance of the difference between the means. <table><tr><td></td><td>Size of sample</td><td>Means</td><td>S.D's</td></tr><tr><td>University A</td><td>400</td><td>55</td><td>10</td></tr><tr><td>University B</td><td>100</td><td>57</td><td>15</td></tr></table>		Size of sample	Means	S.D's	University A	400	55	10	University B	100	57	15	III	CO4						
	Size of sample	Means	S.D's																		
University A	400	55	10																		
University B	100	57	15																		
3D12	The mean life of a sample of 10 electric bulbs was found to be 1456 hours with S.D of 423 hours. A second sample of 17 bulbs chosen from a different batch showed a mean life of 1280 hours with S.D of 398 hours. Is there a significant difference between the means of two batches?	IV	CO4																		
3D13	In a sample of 1000 people on Karnataka 540 are rice eaters and the rest are wheat eaters. Can we assume that both rice and wheat are equally popular in this state at 1% level of significance?	IV	CO4																		
3D14	Two independent samples of 8 and 7 items respectively had the following values. <table><tr><td>SAMPLE-1</td><td>11</td><td>11</td><td>13</td><td>11</td><td>15</td><td>9</td><td>12</td><td>14</td></tr><tr><td>SAMPLE-2</td><td>9</td><td>11</td><td>10</td><td>13</td><td>9</td><td>8</td><td>10</td><td>—</td></tr></table> Is the difference between the means of samples significant	SAMPLE-1	11	11	13	11	15	9	12	14	SAMPLE-2	9	11	10	13	9	8	10	—	II	CO4
SAMPLE-1	11	11	13	11	15	9	12	14													
SAMPLE-2	9	11	10	13	9	8	10	—													
3D15	In an investigation on the machine performance, the following results are obtained <table><tr><td></td><td>NO. of units inspected</td><td>No. of defectives</td></tr><tr><td>Machine 1</td><td>375</td><td>17</td></tr><tr><td>Machine 2</td><td>450</td><td>22</td></tr></table> Test whether there is any significant performance of two machines at $\alpha = 0.05$		NO. of units inspected	No. of defectives	Machine 1	375	17	Machine 2	450	22	IV	CO4									
	NO. of units inspected	No. of defectives																			
Machine 1	375	17																			
Machine 2	450	22																			

UNIT IV: CORELATION AND SIMPLE LINEAR REGRESSION.

S.NO	MULTIPLE CHOICE QUESTIONS	BT LEVELS	COURSE OUTCOMES
4C1	Curve fitting by the method of least squares aims to find the best-fitting _____ to a given set of data points. a) Random values b) Mathematical model c) Outliers d) Median	I	CO4
4C2	In correlation analysis, the correlation coefficient quantifies the _____ and of the relationship between two variables. a) Direction; median b) Strength; direction c) Mean; mode d) Variance; outliers	I	CO4
4C3	Rank correlation, such as the Spearman rank correlation coefficient, is particularly useful when dealing with data that does not follow a _____ distribution. a) Normal b) Exponential c) Poisson d) Binomial	III	CO4
4C4	The Spearman rank correlation coefficient is calculated based on the _____ of the ranked values of the variables being analyzed. a) Sum b) Median c) Ranks d) Mean	V	CO4
4C5	The sign of a correlation coefficient indicates the _____ of the relationship, where a positive sign suggests a positive association, and a negative sign suggests a negative association. a) Origin b) Magnitude c) Direction d) Strength	II	CO4
4C6	When interpreting a correlation coefficient, a magnitude close to _____ indicates a strong relationship between the variables. a) 1 b) 0.5 c) 0 d) -1	III	CO4
4C7	Regression analysis is a statistical technique used to model the relationship between a variable and one or more _____ variables. a) Independent; independent b) Dependent; dependent c) Dependent; independent d) Categorical; ordinal	I	CO4
4C8	In regression analysis, the _____ represents the slope of the regression line, indicating the change in the dependent variable for a one-unit change in the independent variable. a) Mean b) Intercept c) Correlation d) Coefficient	IV	CO4

4C9	The _____ of determination (R-squared) is a measure that tells us the proportion of the variance in the dependent variable explained by the independent variables in a regression model. a) Coefficient b) Slope c) Correlation d) Coefficient	II	CO4
4C10	Tied ranks in rank correlation analysis are handled by assigning the _____ of the tied values the average of the corresponding _____ ranks. a) Sum; absolute b) Median; tied c) Mode; ranked d) Average; tied	VI	CO4
4C11	Correlation does not imply _____. Just because two variables are correlated does not mean that one causes the other. a) Mean b) Mode c) Causation d) Direction	I	CO4
4C12	The _____ term in the linear regression equation represents the value of the dependent variable when the independent variable is zero. a) Slope b) Intercept c) Residual d) Mode	IV	CO4
4C13	The goodness of fit of a fitted exponential curve can be assessed by examining how well the curve aligns with the _____ data points. a) Theoretical b) Median c) Observed d) Mean	I	CO4
4C14	Residual analysis in regression helps assess the _____ of the regression model by examining the differences between the observed and predicted values. a) Strength b) Validity c) Median d) Direction	I	CO4
4C15	A residual plot with no discernible pattern indicates that the regression model is a fit to the data. a) Poor b) Good c) Exponential d) Categorical	II	CO4
FILL IN THE BLANKS QUESTIONS			
4F1	Curve fitting by the method of least squares aims to find the best-fitting _____ to a given set of data points.	IV	CO4
4F2	In correlation analysis, the correlation coefficient quantifies the _____ and _____ of the relationship between two variables.	V	CO4
4F3	Rank correlation, such as the Spearman rank correlation coefficient, is particularly useful when dealing with data that does not follow a _____ distribution.	III	CO4
4F4	The Spearman rank correlation coefficient is calculated based on the _____ of the ranked values of the variables being analyzed.	I	CO4
4F5	The sign of a correlation coefficient indicates the _____ of the relationship, where a positive sign suggests a positive association, and a negative sign suggests a negative association.	II	CO4

4F6	When interpreting a correlation coefficient, a magnitude close to _____ indicates a strong relationship between the variables.	I	CO4
4F7	Regression analysis is a statistical technique used to model the relationship between a variable and one or more _____ variables.	I	CO4
4F8	In regression analysis, the _____ represents the slope of the regression line, indicating the change in the dependent variable for a one-unit change in the independent variable.	II	CO4
4F9	The _____ of determination (R-squared) is a measure that tells us the proportion of the variance in the dependent variable explained by the independent variables in a regression model.	I	CO4
4F10	Tied ranks in rank correlation analysis are handled by assigning the _____ of the tied values the average of the corresponding _____ ranks.	IV	CO4
4F11	Correlation does not imply _____. Just because two variables are correlated does not mean that one causes the other.	I	CO4
4F12	The _____ term in the linear regression equation represents the value of the dependent variable when the independent variable is zero.	VI	CO4
4F13	The goodness of fit of a fitted exponential curve can be assessed by examining how well the curve aligns with the _____ data points.	V	CO4
4F14	Residual analysis in regression helps assess the _____ of the regression model by examining the differences between the observed and predicted values	III	CO4
4F15	A residual plot with no discernible pattern indicates that the regression model is a fit to _____ the data.	I	CO4
MATCH THE FOLLOWING QUESTIONS			
4M1	A. Curve fitting by the method of least squares i. Quadratic regression B. Fitting of Exponential curves ii. Linear regression C. Fitting of parabolas iii. Nonlinear regression D. Fitting of straight lines iv. Fitting of a mathematical model to data points		CO4
4M2	A. Correlation i. Modeling the relationship between dependent and independent variables B. Rank correlation ii. Measuring the strength and direction of a linear relationship C. Regression iii. Proportion of variance explained by independent variables D. Coefficient of determination (R-squared) iv. Spearman rank correlation coefficient	I	CO4

4M3	A.Spearmanrankcorrelationcoefficient i.The relationship between two variables where one B.Residualanalysisii. Handling in rank correlation analysis C.Tiedranksiii.Assessing the validity of a regression model D.Causationiv.Non-parametric measure of association	III	CO4															
4M4	A. Intercept in regression i.Assumption of some statistical methods B.Normal distributionii. Value of the dependent variable when the independent variable is zero C.Exponential distributioniii.Assessment of how well a curve aligns with observed data D.Goodness of fitiv.Common for modeling growth and decay processes	I	CO4															
DESCRIPTIVE QUESTIONS																		
4D1	1. Given that $r_{12}=0.28, r_{13}=0.51, r_{23}=0.49, \sigma_1=2.7, \sigma_2=2.4, \sigma_3=2.7$ find the regression equation of X_3 on X_1 and X_2	I	CO4															
4D2	1. Find the multiple linear regression equation of X_1 on X_2 and X_3 from the data given below, <table><tr><td>X_1</td><td>2</td><td>4</td><td>6</td><td>8</td></tr><tr><td>X_2</td><td>3</td><td>5</td><td>7</td><td>9</td></tr><tr><td>X_3</td><td>4</td><td>6</td><td>8</td><td>10</td></tr></table>	X_1	2	4	6	8	X_2	3	5	7	9	X_3	4	6	8	10	I	CO4
X_1	2	4	6	8														
X_2	3	5	7	9														
X_3	4	6	8	10														

4D3	1. Find the suitable coefficient of correlation for the following data <table><tr><td>Fertilizer used (tonnes)</td><td>65</td><td>66</td><td>67</td><td>67</td><td>68</td><td>69</td><td>70</td><td>72</td></tr><tr><td>Productivity (tonnes)</td><td>67</td><td>68</td><td>65</td><td>68</td><td>72</td><td>72</td><td>69</td><td>71</td></tr></table>	Fertilizer used (tonnes)	65	66	67	67	68	69	70	72	Productivity (tonnes)	67	68	65	68	72	72	69	71	III	CO4																	
Fertilizer used (tonnes)	65	66	67	67	68	69	70	72																														
Productivity (tonnes)	67	68	65	68	72	72	69	71																														
4D4	1. From the following data obtain the rank correlation coefficient after making the adjustments for tied ranks. <table><tr><td>X</td><td>48</td><td>33</td><td>40</td><td>9</td><td>16</td><td>16</td><td>65</td><td>24</td><td>16</td><td>57</td></tr><tr><td>Y</td><td>13</td><td>13</td><td>24</td><td>6</td><td>15</td><td>4</td><td>20</td><td>9</td><td>6</td><td>19</td></tr></table>	X	48	33	40	9	16	16	65	24	16	57	Y	13	13	24	6	15	4	20	9	6	19	V	CO4													
X	48	33	40	9	16	16	65	24	16	57																												
Y	13	13	24	6	15	4	20	9	6	19																												
4D5	1. Calculate the regression equations of Y on X from the data given below, taking the deviations from actual means of X and Y. <table><tr><td>Price (Rs.)</td><td>10</td><td>12</td><td>13</td><td>12</td><td>16</td><td>15</td></tr><tr><td>Amount Demanded</td><td>40</td><td>38</td><td>43</td><td>45</td><td>37</td><td>43</td></tr></table>	Price (Rs.)	10	12	13	12	16	15	Amount Demanded	40	38	43	45	37	43	III	CO4																					
Price (Rs.)	10	12	13	12	16	15																																
Amount Demanded	40	38	43	45	37	43																																
4D6	1. Using least square method, find the constants a and b such that $y = ae^{bx}$, fit the following data, <table><tr><td>x</td><td>0.0</td><td>0.5</td><td>1.0</td><td>1.5</td><td>2.0</td><td>2.5</td></tr><tr><td>y</td><td>0.10</td><td>0.45</td><td>2.15</td><td>9.15</td><td>40.35</td><td>180.75</td></tr></table>	x	0.0	0.5	1.0	1.5	2.0	2.5	y	0.10	0.45	2.15	9.15	40.35	180.75	IV	CO4																					
x	0.0	0.5	1.0	1.5	2.0	2.5																																
y	0.10	0.45	2.15	9.15	40.35	180.75																																
4D7	1. Find the multiple linear regression equation of X_1 on X_2 and X_3 from the data given below, <table><tr><td>X_1</td><td>11</td><td>17</td><td>26</td><td>28</td><td>31</td><td>35</td><td>41</td></tr><tr><td>X_2</td><td>2</td><td>4</td><td>6</td><td>5</td><td>8</td><td>7</td><td>10</td></tr><tr><td>X_3</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>9</td></tr></table>	X_1	11	17	26	28	31	35	41	X_2	2	4	6	5	8	7	10	X_3	2	3	4	5	6	7	9	I	CO4											
X_1	11	17	26	28	31	35	41																															
X_2	2	4	6	5	8	7	10																															
X_3	2	3	4	5	6	7	9																															
4D8	1. Find the constants a and b such that $y = ab^x$ best fit the following data, <table><tr><td>x</td><td>0.2</td><td>0.3</td><td>0.4</td><td>0.5</td><td>0.6</td><td>0.7</td></tr><tr><td>y</td><td>3.16</td><td>2.38</td><td>1.75</td><td>1.34</td><td>1.00</td><td>0.74</td></tr></table>	x	0.2	0.3	0.4	0.5	0.6	0.7	y	3.16	2.38	1.75	1.34	1.00	0.74	V	CO4																					
x	0.2	0.3	0.4	0.5	0.6	0.7																																
y	3.16	2.38	1.75	1.34	1.00	0.74																																
4D9	1. Given the bi-variate data, <table><tr><td>X</td><td>1</td><td>5</td><td>3</td><td>2</td><td>1</td><td>1</td><td>7</td><td>3</td></tr><tr><td>Y</td><td>6</td><td>1</td><td>0</td><td>0</td><td>1</td><td>2</td><td>1</td><td>5</td></tr></table> a) find the regression line of Y on X and hence predict Y if $X = 10$ b) find the regression line of X on Y and hence predict X if $Y = 2.5$	X	1	5	3	2	1	1	7	3	Y	6	1	0	0	1	2	1	5	II	CO4																	
X	1	5	3	2	1	1	7	3																														
Y	6	1	0	0	1	2	1	5																														
4D10	1. The heights of mothers and daughters are given in the following table, <table><tr><td>Height of mother</td><td>62</td><td>63</td><td>64</td><td>64</td><td>65</td><td>66</td><td>68</td><td>70</td></tr><tr><td>Height of daughter</td><td>64</td><td>65</td><td>61</td><td>69</td><td>67</td><td>68</td><td>71</td><td>65</td></tr></table> Form the regression equations and estimate the expected average height of daughter when the height of mother is 64.5 inches?	Height of mother	62	63	64	64	65	66	68	70	Height of daughter	64	65	61	69	67	68	71	65	II	CO4																	
Height of mother	62	63	64	64	65	66	68	70																														
Height of daughter	64	65	61	69	67	68	71	65																														
4D11	Fit a parabola to the data given below <table><tr><td>X</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr><tr><td>Y</td><td>10</td><td>12</td><td>8</td><td>10</td><td>14</td></tr></table>	X	1	2	3	4	5	Y	10	12	8	10	14	VI	CO4																							
X	1	2	3	4	5																																	
Y	10	12	8	10	14																																	
4D12	Fit the least square straight line $y = a + bx$ to the following data X <table><tr><td>Y</td><td>-0.0</td><td>0.5</td><td>1.0</td><td>1.5</td><td>2.0</td><td>2.5</td></tr><tr><td></td><td>0</td><td>5</td><td>0</td><td>5</td><td>0</td><td>5</td></tr><tr><td></td><td>0</td><td>0</td><td>2</td><td>9</td><td>40</td><td>18</td></tr><tr><td></td><td>10</td><td>45</td><td>15</td><td>15</td><td>3</td><td>0</td></tr><tr><td></td><td>1</td><td>1</td><td>1</td><td>1</td><td>5</td><td>75</td></tr></table> Fit the least square parabola $y = a + bx + cx^2$ to the data $f(-1) = -2$, $f(0) = 1$, $f(1) = 2$, $f(2) = 4$,	Y	-0.0	0.5	1.0	1.5	2.0	2.5		0	5	0	5	0	5		0	0	2	9	40	18		10	45	15	15	3	0		1	1	1	1	5	75	I	CO4
Y	-0.0	0.5	1.0	1.5	2.0	2.5																																
	0	5	0	5	0	5																																
	0	0	2	9	40	18																																
	10	45	15	15	3	0																																
	1	1	1	1	5	75																																
4D13		II	CO4																																			

4D14	Find the best fitting straight line to the data	II	CO4																
	<table><tr><td>X</td><td>0</td><td>5</td><td>10</td><td>15</td><td>20</td><td>25</td><td>30</td></tr><tr><td>Y</td><td>10</td><td>14</td><td>19</td><td>25</td><td>31</td><td>36</td><td>39</td></tr></table>	X	0	5	10	15	20	25	30	Y	10	14	19	25	31	36	39		
X	0	5	10	15	20	25	30												
Y	10	14	19	25	31	36	39												
4D15	Fit a second polynomial to the following data by the method of least squares	I	CO4																
	<table><tr><td>X</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td></tr><tr><td>Y</td><td>1</td><td>1.8</td><td>1.3</td><td>2.5</td><td>6.3</td></tr></table>	X	0	1	2	3	4	Y	1	1.8	1.3	2.5	6.3						
X	0	1	2	3	4														
Y	1	1.8	1.3	2.5	6.3														

UNIT V: STOCHASTIC PROCESSES AND MARKOV CHAINS

S.NO	MULTIPLE CHOICE QUESTIONS	BT LEVELS	COURSE OUTCOMES
5C1	A discrete parameter Markov process is called a _____ a) Markov process b) Stationary process c) Random process d) Markov chain	I	CO5
5C2	A square matrix in which the sum of all the elements of each row is called a _____ a) Unitary matrix b) Diagonal matrix c) Stochastic matrix d) Skew matrix	I	CO5
5C3	A stochastic matrix P is said to be regular if all the entries of P^m are _____ a) Negative b) Positive c) Semipositive d) Either positive or negative	III	CO5
5C4	If $\pi = (\pi_1, \pi_2, \pi_3, \dots, \pi_n)$ is the steady state distribution of the chain whose TPM is the n^{th} order square matrix P , then _____ a) $\pi P = \pi$ b) $\pi \mu = \pi$ c) $\pi A = n$ d) $\pi p = p$	V	CO5
5C5	The conditional probability $P[X_n = \frac{a_i}{x_{n-1}} = a_i]$ is called _____ a) Second TPM b) One-step TPM c) Homogenous TPM d) n-step TPM	II	CO5
5C6	If P is the TPM of a homogenous Markov chain, then the n -step TPM $p^{(n)} = P^n$ is known as _____ a) probability theorem b) Chapman-Kolmogorov theorem c) Markov theorem d) Chapman theorem	III	CO5
5C7	State of a Markov chain is said to be _____ with period d_i if $d_i = 1$ a) Periodic b) Not periodic c) Aperiodic d) Biperiodic	I	CO5

5C8	Every state can be reached from every other state; the Markov chain is said to be a) Homogenous b) Reducible c) Irreducible d) Recurrent	IV	CO5
5C9	If $\pi p = \pi$ where $p = \begin{bmatrix} 0 & 1 \\ \frac{1}{2} & \frac{1}{2} \end{bmatrix}$ then value of $(\pi_1 : \pi_2)$ is _____ a) $\begin{pmatrix} 1 & 2 \\ 3 & 3 \end{pmatrix}$ b) $\begin{pmatrix} 1 & 1 \\ 2 & 2 \end{pmatrix}$ c) $\begin{pmatrix} 2 & 1 \\ 3 & 3 \end{pmatrix}$ d) (0,1)	II	CO5
5C10	A Markov chain is completely specified when _____ a) Initial probability distribution b) TPM c) Absorbing state d) Both (a) and (b)	VI	CO5
5C11	Which of the following matrices are stochastic? a) $\begin{bmatrix} 0 & 1 \\ \frac{1}{2} & \frac{1}{2} \end{bmatrix}$ b) $\begin{bmatrix} 1 & 0 \\ -1 & \frac{1}{2} \end{bmatrix}$ c) $\begin{bmatrix} 1 & -1 \\ -1 & 0 \end{bmatrix}$ d) $\begin{bmatrix} 1 & 0 \\ -1 & -1 \end{bmatrix}$	I	CO5
5C12	Sum of each row should be equal to _____ a) 0 b) 2 c) 1 d) 2	IV	CO5
5C13	If all future values can be predicted from past observations is known as _____ a) Non-deterministic stochastic process b) Stationary stochastic process c) Deterministic stochastic process d) Non-Stationary stochastic process	I	CO5
5C14	Stochastic process depends on _____ a) Both sample and time b) Sample c) Time d) Either sample or time	I	CO5
5C15	This set is called _____ a) Mean value b) Stationary value c) Random variables d) Time domain	II	CO5

FILL IN THE BLANKS QUESTIONS

5F1	Anon-null persistent and a periodic state is called _____	IV	CO5
5F2	A state A_i is said to be _____ if the return to state i is certain.	V	CO5
5F3	If a Markov chain is finite irreducible, all its states are _____	III	CO5
5F4	If the one step P_{ij} does not depend on the step i , i.e. $P_{ij}(n-1, n) = P_{ij}(m-1, m)$ the Markov chain is called _____	I	CO5
5F5	State i of a Markov chain is said to be _____ with period $d_i > 1$.	II	CO5
5F6	A state i is said to be _____ if the return to state i is uncertain.	I	CO5
5F7	A state i is said to be _____ if the mean recurrence time μ_{ii} is finite.	I	CO5
5F8	A _____ is completely specified when initial probability distribution and P_{ij} are given.	II	CO5
5F9	A state i is said to be _____ if the mean recurrence time $\mu_{ii} = \infty$	I	CO5
5F10	If the P_{ij} of a Markov chain is $P = \begin{bmatrix} 0.1 & 0.5 & 0.4 \\ 0.6 & 0.2 & 0.2 \\ 0. & 0.4 & 0.3 \end{bmatrix}$. Find $P[X_1=3/X_0=2]$ is _____	IV	CO5
5F11	If X is the continuous and t is the discrete, the stochastic process is called as _____	I	CO5
5F12	A process which is not stationary is said to be _____	VI	CO5
5F13	A _____ is a square matrix with non-negative elements and unit row sums	V	CO5
5F14	A state i is said to be an _____ f and only if $P_{ii} = 1$	III	CO5
5F15	The probability changing from one transition to the rest transition is called _____	I	CO5

MATCH THE FOLLOWING QUESTIONS

5M1	A) A positive recurrent and a periodic state is called	i) stochastic matrix	II	CO5
	B) If a p_{ij} , if all entries of p^n are non-zero positive values then p is said to be a	ii) ergodic		
	C) In a p_{ij} , if the elements of each of the rows are non-negative and sum of the elements is equal to 1. Then p is said to be	iii) regular matrix		

5M2	A)whichmatrixisa stochasticmatrix	i)[¹ ₂ ² ₁ ⁴ ₂]	I	CO5
	B)whichmatrixisaregularmatrix	ii)[⁰ ₂ ⁰ ₄ ¹ ₀]		
	C)whichmatrixisnotastochasticmatrix	iii)[¹ ₂ ⁰ ₂]		
5M3	A)IfF _{ii} =1,thesateiissaidto be	i) Null-persistent	III	CO5
B)IfF _{ii} < 1,thestateiissaidto be	ii)persistent			
C)Ifμ _{ii} =∞ ,itis	iii) transient			
5M4	A) P(X ₁ =1/X ₀ =2)	i) P ₃₂	I	CO5
	B) P(X ₃ =2/X ₃ =3)	ii) P ₂₁		
	C) P(X ₄ =0/X ₂ =3)	iii) P ₄₁		
	D) P(X ₀ =1/X ₀ =4)	iv) P ₃₀		
5M5	A)continuous,continuous	i)discretestochasticsequence	I	CO5
	B)continuous, discrete	ii)discretestochasticprocess		
	C)discrete,continuous	iii)discretestochasticsequence		
	D)discrete,discrete	Iv)continuousstochasticprocess		
DESCRIPTIVEQUESTION				
5D1	Findexpecteddurationofthegame(d _z)ifp= ¹ ₃ , q= ¹ ₂ ,z=1anda=1000.		I	CO5
5D2	Ashok bought a share ofstock for \$10,andit isbelieved that thestock pricemoves (day by day) as a simple random walk with p = 0.55. a) What isthe probabilitythat Ashok’s stock reaches thehigh value of \$15 before the low value of \$5? b) WhatistheprobabilitythatAshokwillbecomeinfinitelyrich?		I	CO5
5D3	Identifywhicharethefollowingareregular matrices?		III	CO5

	$i) \begin{bmatrix} 0 & 0 & 1 \\ 1 & 0 & \frac{1}{2} \\ 0 & 1 & 0 \end{bmatrix} \quad ii) \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix} \quad iii) \begin{bmatrix} 0 & 0 \\ 1 & 1 \\ 1 & 1 \end{bmatrix}$		
5D4	A fair die is tossed repeatedly. If X_n denotes the maximum of the numbers occurring in the first n tosses, Determine the transition probability matrix P of the Markov chain $\{X_n\}$. Evaluate P^2 and $P(X=6)$.	V	CO5
5D5	Select which of the following are stochastic matrices? $i) \begin{bmatrix} 1 & 0 \\ 2 & 2 \end{bmatrix}$ $ii) \begin{bmatrix} 1 & 2 & 4 \\ 2 & 3 & 3 \\ 4 & 4 & 2 \end{bmatrix}$ $iii) \begin{bmatrix} 1 & 3 & 3 \\ 2 & 1 & 2 \end{bmatrix}$	III	CO5
5D6	The transition probability matrix (tpm) is given as follows. $P = \begin{bmatrix} 0.3 & 0.7 & 0 \\ 0.1 & 0.4 & 0.5 \\ 0 & 0.2 & 0.8 \end{bmatrix}$ Is the matrix irreducible?	IV	CO5
5D7	A training process considered as a two state Markov chain. If it rains, it is considered to be in state '0' and it does not rain is in the state of '1'. The transition probability of the Markov chain is defined by $P = \begin{bmatrix} 0.6 & 0.4 \\ 0.2 & 0.8 \end{bmatrix}$. Find the probability that it will rain for 3 days from today assuming that it is raining today.	I	CO5
5D8	Three boys A, B, and C are throwing a ball to each other. A always throws the ball to B and B always throws the ball to C; but C is just as likely to throw the ball to B as to A. Prove that the process is the Markov chain. Find the transition matrix and classify the states.	V	CO5
5D9	The transition probability matrix (tpm) of a Markov chain $\{X_n\}$ 1, 2, 3, ... having three states 1, 2, and 3 is $P = \begin{bmatrix} 0.3 & 0.7 & 0 \\ 0.1 & 0.4 & 0.5 \\ 0 & 0.2 & 0.8 \end{bmatrix}$ And the initial distribution is $P^0 = [0.7, 0.2, 0.1]$ Illustrate (i) $P\{X_2=3\}$ (ii) $P\{X_3=2, X_2=3, X_1=3, X_0=2\}$	II	CO5
5D10	Explain briefly about the stochastic matrix and the Markov process.	II	CO5
5D11	Discuss the nature of states of the Markov chain with tpm $P = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 2 & 1 \\ 0 & 1 & 0 \end{bmatrix}$	VI	CO5
5D12	Find the fixed probability vector for the regular stochastic matrix $\begin{bmatrix} 12 & 13 \\ 44 \end{bmatrix}$	I	CO5
5D13	The transition probability matrix (tpm) of a Markov chain $\{X_n\}$ 1, 2, 3, ... having three states 1, 2, and 3 is $P = \begin{bmatrix} 3 & 1 & 0 \\ 4 & 4 & 1 \\ 4 & 2 & 4 \end{bmatrix}$ And the initial distribution is $P(X=i) = \frac{1}{3}, i=0, 1, 2$ Interpret (i) $P(X_1=1/X_0=2)$ (ii) $P(X_2=2/X_1=1)$ (iii) $P(X_2=2, X_1=1/X_0=2)$ (iv) $P(X_2=2, X_1=1, X_0=2)$ (v) $P(X_3=1, X_2=2, X_1=1, X_0=2)$	II	CO5

5D14	Find the value of x, y, z if $\begin{bmatrix} 0 & x & \frac{1}{3} \\ 0 & 0 & y \\ \frac{1}{3} & \frac{1}{3} & z \end{bmatrix}$ is a transition probability matrix	II	CO5
5D15	Suppose that the probability of a dry (state 0) following a rainy day (state 1) is $\frac{1}{3}$ and that the probability of a rainy day following a dry day is $\frac{1}{2}$. Given that May 1 st is a dry day. Find the probability i) May 3 rd is also a dry day ii) May 5 th is also a dry day?	I	CO5

	SRI INDU COLLEGE OF ENGINEERING AND TECHNOLOGY (SHERIGUDA(V),IBRAHIMPATNAM(M),RANGAREDDYDIST.-501510) (Regulation:R22) Department of CSE(AIML-A)		
	Sub.Code&Title	(R22MTH2215)MATHEMATICAL AND STATISTICAL FOUNDATIONS.	
	Academic Year:2023-24	Year/Sem	II/II
	Faculty Name& Designation	T.Srinivasulu(Asst.Professor)	

ASSIGNMENT FORM ID1

GROUP-I(22D41A6601-22D41A6606)

QNO	QUESTION	BT LEVEL	CO
1	Show that $2^{340} \equiv 1 \pmod{11}$ by Fermat's little theorem	I	CO1
2	Use prime factorization to find GCD and LCM of i) 119, 272 ii) 540, 504 iii) 580, 316	I	CO1
3	Ten coins are thrown simultaneously. Find the prob. of getting at least (1) Seven Heads (2) six heads (3) one head.	II	CO2
4	If a random variable has the probability density function $f(x) = \begin{cases} k(x^2-1), & -1 \leq x \leq 3 \\ 0, & \text{Elsewhere} \end{cases}$ Find the value of k and $P(1/2 \leq x \leq 5/2)$	II	CO2
5	If two independent random samples of size $n_1=13$ and $n_2=7$ are taken from a normal population. What is the probability that the variance of the first sample will be at least 4 times as large as that of the second sample.	I	CO3

GROUP-II(22D41A6607-22D41A6612)

QNO	QUESTION	BT LEVEL	CO
1	Find the remainder when i) 66^{98} is divided by 97 ii) 12^{114} is divided by 17 iii) 6^{59} is divided by 11	I	CO3
2	Use prime factorization to find the LCM of i) 60, 61 ii) 482, 1687 iii) 2520, 4950	I	CO4
3	A continuous r.v. X has the distribution function $F(x) = \begin{cases} 0, & \text{if } x \leq 1 \\ K(x-1)^4, & \text{if } 1 < x \leq 3 \\ 1, & \text{if } x > 3 \end{cases}$ Determine (i) $f(x)$ (ii) k (iii) Mean	II	CO4
4	The density function of a random variable X is $F(x) = \begin{cases} e^{-x}, & x \geq 0 \\ 0, & \text{otherwise} \end{cases}$ Find $E(x)$, $E(x^2)$, $\text{var}(x)$	II	CO5
5	A random sample of size 25 from a normal population has the mean $\bar{x}=47.5$ and the standard deviation $S=8.4$. Does this information tend to support (or) refuse the claim that the mean of the population is $\mu=42.5$?	III	CO3

GROUP-III(22D41A6613-22D41A6618)

QNO	QUESTION	BT LEVEL	CO
1	Solve $4x \equiv 5 \pmod{9}$, $2x \equiv 6 \pmod{20}$.	III	CO1
2	State and prove Fermat's little theorem.	V	CO1

**ROUP-IV
(22D41A6619-22D41A6624)**

G

3	If the p.d.f of a r.v. is given by $F(x) = \begin{cases} K(1-x)^2, & \text{for } 0 < x < 1 \\ 0, & \text{elsewhere} \end{cases}$	II	CO2
4	If X is a normal variate with mean 30 and standard deviation 5. Find (1) $P(26 \leq X \leq 40)$ (2) $P(X \geq 45)$	II	CO2
5	Find a) $P(t < 2.365)$ when $v = 7$ d.o.f b) $P(t > 1.318)$ when $v = 24$ d.o.f c) $P(-1.356 < t < 2.179)$ when $v = 12$ d) $P(t > -2.567)$ when $v = 17$	I	CO3

QNO	QUESTION	BTLEVEL	CO																
1	Discuss the system of simultaneous congruence $x \equiv 1 \pmod{4}$, $x \equiv 0 \pmod{3}$ and $x \equiv 5 \pmod{7}$.	VI	CO1																
2	State and prove Chinese remainder theorem (CRT)	V	CO1																
3	A random variable X has the following probability function <table><tr><td>x</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr><tr><td>P(x)</td><td>k</td><td>3k</td><td>5k</td><td>7k</td><td>9k</td><td>11k</td><td>13k</td></tr></table> (1) Find K (2) Evaluate $p(x < 4)$ (3) $P(x \geq 5)$ (4) $P(3 < x \leq 6)$ (5) What is the smallest value of X for which $p(X \leq x) > 1/2$?	x	0	1	2	3	4	5	6	P(x)	k	3k	5k	7k	9k	11k	13k	II	CO2
x	0	1	2	3	4	5	6												
P(x)	k	3k	5k	7k	9k	11k	13k												
4	For the discrete probability distribution <table><tr><td>x</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr><tr><td>P(x)</td><td>k</td><td>3k</td><td>5k</td><td>7k</td><td>9k</td><td>11k</td><td>13k</td></tr></table> Find (i) K (ii) mean (iii) variance	x	0	1	2	3	4	5	6	P(x)	k	3k	5k	7k	9k	11k	13k	II	CO2
x	0	1	2	3	4	5	6												
P(x)	k	3k	5k	7k	9k	11k	13k												
5	A normal population has mean of 0 and S.D of 2.1. Find the probability that mean of a sample of size 900 will be negative.	I	CO3																

GROUP-V(22D41A6625-22D41A6630)

QNO	QUESTION	BTLEVEL	CO								
1	Find the number of distinct solutions of linear congruence. i) $15x \equiv 25 \pmod{35}$ ii) $15x \equiv 24 \pmod{35}$ iii) $4x \equiv 3 \pmod{7}$	I	CO1								
2	Justify the inverse of 33 modulo 91.	V	CO1								
3	Let X denote the minimum of the two numbers that appear when a pair of fair dice is thrown once. Determine their (i) Discrete Probability distribution (ii) Expectation (iii) Variance.	II	CO2								
4	A variate X has the following probability distribution <table border="1" style="margin: 10px auto; border-collapse: collapse;"> <tr> <td>x</td><td>-3</td><td>6</td><td>9</td></tr> <tr> <td>P(x)</td><td>1/6</td><td>1/2</td><td>1/3</td></tr> </table> Find (i) $E(X)$ (ii) $E(X^2)$ (iii) $E(2X+1)^2$	x	-3	6	9	P(x)	1/6	1/2	1/3	II	CO2
x	-3	6	9								
P(x)	1/6	1/2	1/3								
5	A random sample of size 64 is taken from a normal population with (mean) $\mu = 51.4$ and $\sigma = 6.8$. What is the probability that the mean of sample will (a) Exceed 52.9 (b) Fall between 50.5 and 52.3 (c) Be less than 50.6	I	CO3								

GROUP-VI(22D41A6631-22D41A6636)

QNO	QUESTION	BTLEVEL	CO
1	Solve the linear congruence i) $3x \equiv 2 \pmod{8}$ ii) $4x \equiv 3 \pmod{7}$ iii) $6x \equiv 5 \pmod{9}$.	III	CO1
2	Show that $\sqrt{2}$ is not a rational number.	I	CO1
3	A fair die is tossed. Let the r.v. X denote the twice the number appearing on the die i) Write the probability distribution of X ii) mean iii) the variance	II	CO2
4	probability density function of a r.v. X is $F(x)$ $= \begin{cases} \frac{1}{2} * \sin x; & \text{for } 0 \leq x \leq \pi \\ 0, & \text{Elsewhere} \end{cases}$ Find the mean, mode and median of the distribution and also find the probability between 0 and $\pi/2$	II	CO2
5	If population is 3, 6, 9, 15, 27. Find the a. List of all possible samples of size 3 that can be taken without replacement from finite population. b. Calculate the mean of each of sampling distribution of means. c. Find the standard deviation of sampling distribution of means.	I	CO3

GROUP-VII(22D41A6637-22D41A6642)

QNO	QUESTION	BTLEVEL	CO
1	Use prime factorization to illustrate GCD and LCM of i) 1274, 3087, 1085 ii) 81, 100, 289.	II	CO1
2	Show that 43 is a prime.	I	CO1
3	A Continuous r.v. X has the distribution function $f(x) = \begin{cases} 0, & \text{if } x \leq 1 \\ K(x - 1)^4, & \text{if } 1 < x \leq 3 \\ 1, & \text{if } x > 3 \end{cases}$ Determine (i) $f(x)$ (ii) k (iii) Mean	II	CO2
4	The density function of a random variable X is $F(x) = \begin{cases} e^{-x}, & x \geq 0 \\ 0, & \text{otherwise,} \end{cases}$ find $E(x)$, $E(x^2)$, $\text{var}(x)$	II	CO2
5	Samples of size 2 are taken from population 3, 6, 9, 15, 27 with replacement. Find a] The mean of the population. b] The standard deviation of population. c] The mean of sampling distribution of means. d] The standard deviation of sampling distribution of means.	I	CO3

GROUP-VIII(22D41A6643-22D41A6648)

QNO	QUESTION	BTLEVEL	CO
1	Use prime factorisation to find GCD and LCM of (i) 1337, -501 (ii) 3367, 3219.	I	CO1
2	Determine the number of divisors and sum of the divisors of (i) 74088 (ii) 14553.	V	CO1
3	Assume that 50% of all engineering students are good in mathematics. Determine the probabilities that among 18 engineering students (i) Exactly 10 (ii) at least 10 (iii) at most 8 mathematics. (iv) at least 2 and at most 9 are good in mathematics	II	CO2
4	The mean of Binomial distribution is 3 and The variance is $9/4$. Find (i) the value of n (ii) $p(x \geq 7)$ (iii) $P(1 \leq x < 6)$.	II	CO2
5	Samples of size 2 are taken from population 1, 2, 3, 4, 5, 6 without replacement. Find a] The mean of the population. b] The standard deviation of population. c] The mean of sampling distribution of means. d] The standard deviation of sampling distribution of means.	I	CO3

GROUP-IX(22D41A6649-22D41A6654)

QNO	QUESTION	BTLEVEL	CO														
1	Illustrate the integers x and y such that (i) $423x + 198y = 9$ (ii) $252x + 595y = 7$.	II	CO1														
2	Find prime factorization of (i) 392 (ii) 1001 (iii) 67375	I	CO1														
3	If 2% of light bulbs are defective, find the Probability (i) At least one is defective. (ii) Exactly 7 are defective (iii) $P(1 < x < 8)$ in a sample of 100.	II	CO2														
4	Fit the Binomial distribution to the following data:	II	CO2														
	<table><tr><td>X</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td></td></tr><tr><td>f(x)</td><td>30</td><td>62</td><td>46</td><td>10</td><td>2</td><td></td></tr></table>			X	0	1	2	3	4		f(x)	30	62	46	10	2	
	X			0	1	2	3	4									
f(x)	30	62	46	10	2												
5	A population consists of 6 numbers 4, 8, 12, 16, 20, 24. Consider all possible samples of size two which can be drawn without replacement from the population. Find a) The mean of the population. b) The standard deviation of population. c) The mean of sampling distribution of means. d) The standard deviation of sampling distribution of means.	I	CO3														

GROUP-X(22D41A6655-22D41A6660)

QNO	QUESTION	BTLEVEL	CO																		
1	If $\text{GCD}(7469,2464)=d$ then find d using Euclid's algorithm and then express d as a linear combination of 7469 and 2464.	I	CO1																		
2	If $a=-308,b=136$. Find $\text{GCD}(a,b)$ and construct $\text{GCD}(a,b)$ in the form $ax+by$.	IV	CO1																		
3	Define (i) Random variable (ii) Discrete random variable (iii) Continuous random variable.	II	CO2																		
4	Seven Coins are tossed and the number of heads noted. The experiment is repeated 128 times with the following data	II	CO2																		
	<table><tr><td>No. of heads</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr><tr><td>frequencies</td><td>7</td><td>6</td><td>19</td><td>35</td><td>30</td><td>23</td><td>7</td><td>1</td></tr></table>			No. of heads	0	1	2	3	4	5	6	7	frequencies	7	6	19	35	30	23	7	1
	No. of heads			0	1	2	3	4	5	6	7										
	frequencies			7	6	19	35	30	23	7	1										
Fit a binomial distribution assuming 1. The coin is unbiased 2. The nature of the Coin is not known.																					
5	A population consists of 5, 10, 14, 18, 13, 24. Consider all possible samples of size two which can be drawn without replacement from the population. Find a] The mean of the population. b] The standard deviation of population. c] The mean of sampling distribution of means. The standard deviation of sampling distribution of means.	I	CO3																		

GROUP-XI(22D41A6661-22D41A6664&23D45A6601-02)

QNO	QUESTION	BTLEVEL	CO
1	Evaluate $GCD(858, 728, 325)$.	IV	CO1
2	If $GCD(1819, 3587) = d$ then find integers x and y such that $1819x + 3587y = d$.	I	CO1
3	A sample of 3 items is selected at random from a box containing 10 items of which 4 are defective. Find the expected no. of defective items.	II	CO2
4	If 20% of light bulbs are defective. Find (i) At least one is defective (ii) Exactly 2 are defective (iii) $P(1 < x < 8)$ in a sample of 100.	II	CO2
5	A population consists of five numbers 2, 3, 6, 8 and 11. Consider all possible samples of size two which can be drawn with replacement from this population. Find a. The mean of the population. b. The standard deviation of population. c. The mean of sampling distribution of means. d. The standard deviation of sampling distribution of means.	III	CO3

GROUP-XII(23D45A6603-23D45A6606)

QNO	QUESTION	BTLEVEL	CO
1	Find the GCD of $414, 662$ and $2210, 493$	I	CO1
2	Find the GCD of 42824 and 6409 using Euclidean algorithm.	I	CO1
3	The probability of a man hitting a target is $\frac{1}{3}$. If he fires 5 times, what is the probability of his hitting the target at least twice? How many times must he fire so that the probability of his hitting the target at least once is more than 90%?	II	CO2
4	Two dice are thrown 120 times. Find the average no. of times in which the number on the first die exceeds the no. on the second die.	II	CO2
5	Define the Central Limit Theorem.	I	CO3

Faculty

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	SRI INDU COLLEGE OF ENGINEERING AND TECHNOLOGY (SHERIGUDA(V),IBRAHIMPATNAM(M),RANGAREDDYDIST.-501510) (Regulation :R22) DepartmentofCSE(AIML-B)		
	Sub.Code&Title	(R22MTH2215)MATHEMATICALANDSTATISTICAL FOUNDATIONS.	
	AcademicYear:2023-24	Year/Sem	II/II
	FacultyName& Designation	T.Srinivasulu(Asst.Professor)	

ASSIGNMENT FOR MID 1

GROUP-I(22D41A6665-22D41A6670)

QNO	QUESTION	BTLEVEL	CO
1	FindtheGCDof $414,662$ and $2210,493$	I	CO1
2	FindtheGCDof 42824 and 6409 using Euclidean algorithm.	I	CO1
3	The probability of a man hitting a target is $\frac{1}{3}$. If he fires 5 times, what is the probability of his hitting the target at least twice? How many times must he fire so that the prob of his hitting the target at least once is more than 90%?	II	CO2
4	Two dice are thrown 120 times. Find the average no. of times in which, the number on the first die exceeds the no. on the Second die.	II	CO2
5	Define the Central Limit Theorem.	I	CO3

GROUP-II(22D41A6671-22D41A6676)

QNO	QUESTION	BTLEVEL	CO
1	Evaluate $GCD(858,728,325)$.	IV	CO1
2	If $GCD(1819,3587)=d$ then find integers x and y such that $1819x+3587y=d$.	I	CO1
3	A sample of 3 items is selected at random from a box containing 10 items of which 4 are defective. Find the expected no. of defective items?	II	CO2
4	If 20% of light bulbs are defective. Find (i) At least one is defective (ii) Exactly 2 are defective (iii) $P(1 < x < 8)$ in a sample of 100.	II	CO2
5	A population consists of five numbers 2, 3, 6, 8 and 11. Consider all possible samples of size two which can be drawn with replacement from this population. Find a. The mean of the population. b. The standard deviation of population. c. The mean of sampling distribution of means. d. The standard deviation of sampling distribution of means.	III	CO3

GROUP-III(22D41A6677-22D41A6682)

QNO	QUESTION	BTLEVEL	CO																		
1	If $GCD(7469,2464)=d$ then find d using Euclid's algorithm and then express d as a linear combination of 7469 and 2464.	I	CO1																		
2	If $a=-308, b=136$. Find $GCD(a,b)$ and construct $GCD(a,b)$ in the form $ax+by$.	IV	CO1																		
3	Define (i) Random variable (ii) Discrete random variable (iii) Continuous random variable.	II	CO2																		
4	Seven Coins are tossed and the number of heads noted. The experiment is repeated 128 times with the following data <table><tr><td>No. of heads</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr><tr><td>frequencies</td><td>7</td><td>6</td><td>19</td><td>35</td><td>30</td><td>23</td><td>7</td><td>1</td></tr></table> Fit a binomial distribution assuming 1. The coin is unbiased 2. The nature of the Coin is not known.	No. of heads	0	1	2	3	4	5	6	7	frequencies	7	6	19	35	30	23	7	1	II	CO2
No. of heads	0	1	2	3	4	5	6	7													
frequencies	7	6	19	35	30	23	7	1													

5	A population consists of 5, 10, 14, 18, 13, 24. Consider all possible samples of size two which can be drawn without replacement from the population. Find a) The mean of the population. b) The standard deviation of population. c) The mean of sampling distribution of means. The standard deviation of sampling distribution of means.	I	CO3
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GROUP-IV(22D41A6683-22D41A6688)

QNO	QUESTION	BTLEVEL	CO												
1	Illustrate the integers x and y such that i) $423x + 198y = 9$ ii) $252x + 595y = 7$.	II	CO1												
2	Find prime factorization of i) 392 ii) 1001 iii) 67375	I	CO1												
3	If 2% of light bulbs are defective, find the Probability it (i) At least one is defective. i) Exactly 7 are defective (ii) $P(1 < x < 8)$ in a sample of 100.	II	CO2												
4	Fit the Binomial distribution to the following data: <table><tr><td>X</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td></tr><tr><td>f(X)</td><td>30</td><td>62</td><td>46</td><td>10</td><td>2</td></tr></table>	X	0	1	2	3	4	f(X)	30	62	46	10	2	II	CO2
X	0	1	2	3	4										
f(X)	30	62	46	10	2										
5	A population consists of 6 numbers 4, 8, 12, 16, 20, 24. Consider all possible samples of size two which can be drawn without replacement from the population. Find a) The mean of the population. b) The standard deviation of population. c) The mean of sampling distribution of means. d) The standard deviation of sampling distribution of means.	I	CO3												

GROUP-V(22D41A6689-22D41A6694)

QNO	QUESTION	BT LEVEL	CO
1	Use prime factorisation to find GCD and LCM of i) 1337, -501 ii) 3367, 3219.	I	CO1
2	Determine the number of divisors and sum of the divisors of i) 74088 ii) 14553.	V	CO1
3	Assume that 50% of all engineering students are good in mathematics. Determine the probabilities that among 18 engineering students i) Exactly 10 (ii) at least 10 (iii) at most 8 mathematics. (iv) at least 2 and at most 9 are good in mathematics	II	CO2
4	The mean of Binomial distribution is 3 and the variance is $9/4$. Find (i) the value of n (ii) $p(x \geq 7)$ (iii) $P(1 \leq x < 6)$.	II	CO2
5	Samples of size 2 are taken from population 1, 2, 3, 4, 5, 6 without replacement. Find a) The mean of the population. b) The standard deviation of population. c) The mean of sampling distribution of means. d) The standard deviation of sampling distribution of means.	I	CO3

GROUP-VI(22D41A6695-22D41A66A0)

QNO	QUESTION	BTLEVEL	CO
1	Use prime factorization to illustrate GCD and LCM of $1274, 3087, 1085$ ii) $81, 100, 289$.	II	CO1
2	Show that 43 is a prime.	I	CO1
3	A continuous r.v. X has the distribution function $f(x) = \begin{cases} 0, & \text{if } x \leq 1 \\ K(x-1)^4, & \text{if } 1 < x \leq 3 \\ 1, & \text{if } x > 3 \end{cases}$ Determine (i) $f(x)$ (ii) k (iii) Mean	II	CO2
4	The density function of a random variable X is $F(x) = \begin{cases} e^{-x}, & x \geq 0 \\ 0, & \text{otherwise,} \end{cases}$ find $E(x), E(x^2), \text{var}(x)$	II	CO2
5	Samples of size 2 are taken from population 3, 6, 9, 15, 27 with replacement. Find a) The mean of the population. b) The standard deviation of population. c) The mean of sampling distribution of means. d) The standard deviation of sampling distribution of means.	I	CO3

GROUP-VII(22D41A66A1-22D41A66A6)

QNO	QUESTION	BTLEVEL	CO
1	Solve the linear congruence i) $3x \equiv 2 \pmod{8}$ ii) $4x \equiv 3 \pmod{7}$ iii) $6x \equiv 5 \pmod{9}$.	III	CO1
2	Show that $\sqrt{2}$ is not a rational number.	I	CO1
3	A fair die is tossed. Let the r.v. X denote the twice the number appearing on the die i) Write the probability distribution of X ii) mean iii) the variance	II	CO2
4	probability density function of a r.v. X is $F(x) = \begin{cases} \frac{1}{2} \sin x, & \text{for } 0 \leq x \leq \pi \\ 0, & \text{Elsewhere} \end{cases}$ Find the mean, mode and median of the distribution and also find the probability between 0 and $\pi/2$	II	CO2
5	If population is 3, 6, 9, 15, 27. Find the a. List of all possible samples of size 3 that can be taken without replacement from finite population. b. Calculate the mean of each of sampling distribution of means. c. Find the standard deviation of sampling distribution of means.	I	CO3

GROUP-VIII(22D41A66A7-22D41A66B2)

QNO	QUESTION	BTLEVEL	CO								
1	Find the number of distinct solutions of linear congruence. i) $15x \equiv 25 \pmod{35}$ ii) $15x \equiv 24 \pmod{35}$ iii) $4x \equiv 3 \pmod{7}$	I	CO1								
2	Justify the inverse of 33 modulo 91.	V	CO1								
3	Let X denote the minimum of the two numbers that appear when a pair of fair dice is thrown once. Determine their (i) Discrete Probability distribution. (ii) Expectation (iii) Variance.	II	CO2								
4	A variate X has the following probability distribution <table border="1" data-bbox="127 1765 354 1854"> <tr> <td>x</td><td>-3</td><td>6</td><td>9</td></tr> <tr> <td>P(x)</td><td>1/6</td><td>1/2</td><td>1/3</td></tr> </table> Find (i) $E(X)$ (ii) $E(x^2)$ (iii) $E(2X+1)^2$	x	-3	6	9	P(x)	1/6	1/2	1/3	II	CO2
x	-3	6	9								
P(x)	1/6	1/2	1/3								
5	A random sample of size 64 is taken from a normal population with (mean) $\mu = 51.4$ and $\sigma = 68$. What is the probability that the mean of sample will a) Exceed 52.9 b) Fall between 50.5 and 52.3 c) Be less than 50.6	I	CO3								

GROUP-IX(22D41A66B3-22D41A66B8)

QNO	QUESTION	BTLEVEL	CO																
1	Discuss the system of simultaneous congruence $x \equiv 1 \pmod{4}$, $x \equiv 0 \pmod{3}$ and $x \equiv 5 \pmod{7}$.	VI	CO1																
2	State and prove Chinese remainder theorem (CRT)	V	CO1																
3	A random variable X has the following probability function <table><tr><td>x</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr><tr><td>P(x)</td><td>k</td><td>3k</td><td>5k</td><td>7k</td><td>9k</td><td>11k</td><td>13k</td></tr></table> (1) Find K (2) Evaluate $P(x < 4)$ (3) $P(x \geq 5)$ (4) $P(3 < x \leq 6)$ (5) What is the smallest value of X for which $P(X \leq x) > 1/2$?	x	0	1	2	3	4	5	6	P(x)	k	3k	5k	7k	9k	11k	13k	II	CO2
x	0	1	2	3	4	5	6												
P(x)	k	3k	5k	7k	9k	11k	13k												
4	For the discrete probability distribution <table><tr><td>x</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr><tr><td>P(x)</td><td>k</td><td>3k</td><td>5k</td><td>7k</td><td>9k</td><td>11k</td><td>13k</td></tr></table> Find (i) K (ii) mean (iii) variance	x	0	1	2	3	4	5	6	P(x)	k	3k	5k	7k	9k	11k	13k	II	CO2
x	0	1	2	3	4	5	6												
P(x)	k	3k	5k	7k	9k	11k	13k												
5	A normal population has mean of 0 and S.D of 2.1. Find the probability that mean of a sample of size 900 will be negative.	I	CO3																

GROUP-X(22D41A66B9-22D41A66C4)

QNO	QUESTION	BTLEVEL	CO
1	Solve $4x \equiv 5 \pmod{9}$, $2x \equiv 6 \pmod{20}$.	III	CO1
2	State and prove Fermat's little theorem.	V	CO1
3	If the p.d.f. of x is given by $F(x) = \begin{cases} K(1-x)^2, & \text{for } 0 < x < 1 \\ 0, & \text{elsewhere} \end{cases}$ Find K.	II	CO2
4	If X is a normal variate with mean 30 and standard deviation 5. Find (1) $P(26 \leq X \leq 40)$ (2) $P(X \geq 45)$	II	CO2
5	Find a) $P(t < 2.365)$ when $v = 7$ d.o.f b) $P(t > 1.318)$ when $v = 24$ d.o.f c) $P(-1.356 < t < 2.179)$ when $v = 12$ d) $P(t > -2.567)$ when $v = 17$	I	CO3

GROUP-XI(22D41A66C5-22D45A6607)

QNO	QUESTION	BTLEVEL	CO
1	Find the remainder when i) 66^{98} is divided by 97 ii) 12^{114} is divided by 17 iii) 6^{59} is divided by 11	I	CO3
2	Use prime factorization to find the LCM of i) 60, 61 ii) 482, 1687 iii) 2520, 4950	I	CO4
3	A continuous r.v. X has the distribution function $F(x) =$ $\begin{cases} 0, & \text{if } x \leq 1 \\ K(x-1)^4, & \text{if } 1 < x \leq 3 \\ 1, & \text{if } x > 3 \end{cases}$ Determine (i) $f(x)$ (ii) k (iii) Mean	II	CO4
4	The density function of a random variable X is $f(x) = \begin{cases} e^{-x}, & x \geq 0 \\ 0, & \text{otherwise} \end{cases}$ find $E(x)$, $E(x^2)$, $\text{var}(x)$	II	CO5
5	A random sample of size 25 from a normal population has the mean $\bar{x} = 47.5$ and the standard deviation $S = 8.4$. Does this information tend to support (or) refuse the claim that the mean of the population is $\mu = 42.5$?	III	CO3

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GROUP-XII(23D45A6608-23D45A6613)

QNO	QUESTION	BTLEVEL	CO
1	Show that $2^{340} \equiv 1 \pmod{11}$ by Fermat's little theorem	I	CO1
2	Use prime factorization to find GCD and LCM of i) 119, 272 ii) 540, 504 iii) 580, 316	I	CO1
3	Ten coins are thrown simultaneously. Find the prob. of getting at least (1) Seven Heads (2) six heads (3) one head.	II	CO2
4	If a random variable has the probability density function $f(x) = \begin{cases} k(x^2-1), & -1 \leq x \leq 3 \\ 0, & \text{Elsewhere} \end{cases}$ Find the value of k and $P(1/2 \leq x \leq 5/2)$	II	CO2
5	If two independent random samples of size $n_1=13$ and $n_2=7$ are taken from a normal population. What is the probability that the variance of the first sample will be at least 4 times as large as that of the second sample.	I	CO3

Faculty

HOD

	SRIINDUCOLLEGE OF ENG & TECH (Regulation: R22)			Page(s):
	Department of CSE (ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)			
	Sub.Code & Title	(R22MTH2215) Mathematical and Statistical Foundations		
	Academic Year: 2023-24	Year/Sem./Section	II/II: AIML	
	Faculty Name & Designation	T.SRINIVASULU, Asst. Professor		

Topic-wise Link of Video Lectures

Unit1	Greatest Common Divisors and Prime Factorization	https://archive.nptel.ac.in/courses/111/103/111103020/
Unit2	Simple Linear Regression and Correlation	https://archive.nptel.ac.in/courses/111/104/111104098/
Unit3	Continuous Probability Distributions	https://archive.nptel.ac.in/courses/111/104/111104079/
Unit4	Estimation & Tests of Hypotheses	https://archive.nptel.ac.in/courses/103/106/103106120/
Unit5	Stochastic Processes and Markov Chains	https://nptel.ac.in/courses/111102014

CONTENT BEYOND THE SYLLABUS

S. No	Topics	Proposed Actions	Date	Resource Person/Mode	POs	PSOs
1	Bernoulli's and exponential distributions	To get knowledge		T.Srinivasulu/ Black Board	PO1	PSO1, PSO2
2	Classification of samples	To get knowledge		T.Srinivasulu/ Black Board	PO1	PSO1, PSO2

	SRIINDUCOLLEGE OF ENG& TECH (Regulation: R22)			Page(s):
	Department of CSE (ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)			
	Sub.Code & Title	(R22MTH2215) Mathematical and Statistical Foundations		
	Academic Year: 2023-24	Year/Sem./Section	II/II: AIML	
Faculty Name & Designation	T.SRINIVASULU, Asst. Professor			

SELF STUDY TOPICS			
S.No.	Topics	Books & Journals	Course Outcomes

1.	Algebraic formulas	https://journals.uwyo.edu/index.php/ela	CO1
2.	2-D and 3-D dimensional coordinate system	http://www.geometry.net/math.html	CO2
3.	Binomial theorem	NCERTBOOK	CO3
4.	Limits and continuity	NCERTBOOK	CO3
5.	Trigonometric functions	NCERTBOOK	CO4
6.	Partial fractions	R.D Sharma	CO3

MID AND END QUESTION PAPERS

MID-1PAPER

BR-22 © SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY
 II B.Tech - II Semester - I Mid Term Examination, April - 2024
 (R22MTH2215) MATHEMATICAL AND STATISTICAL FOUNDATIONS

D4

Duration: 2 Hrs
 Dt: 08-04-2024, Day-1 (FN)

Max Marks: 30M

Part - A

Marks: 10Qx1/2M = 5M

Answer All multiple choice questions.

* (L1-Remembering, L2-Understanding, L3-Appling, L4-Analyzing, L5-Evaluating, and L6-Creating.)

Bliss Taxonomy Levels	Course Outcomes
II	CO2
I	CO2
I	CO2
IV	CO2
II	CO2
VI	CO2
III	CO2
IV	CO2
I	CO3
VI	CO3

- The sum and product of two even integers is _____ integer.
 A) odd B) even C) both D) None
- Find the GCD of 56 and 72 .
 A) 8 B) -5 C) 4 D) $\frac{1}{2}$
- Find integers x and y such that $256x + 116y = 4$.
 A) $x=5, y=-11$ B) $x=9, y=3$ C) $x=5, y=-2$ D) $x=6, y=-11$.
- Simplify $\text{GCD}(a,b) \times \text{LCM}(a,b) =$ _____
 A) a/b B) $a+b$ C) $a-b$ D) ab
- Illustrate Variance of the binomial distribution is _____
 A) np B) npq C) nq D) None
- If the probability density of a random variable is given by

$$f(x) = \begin{cases} kx^3, & 0 < x < 1 \\ 0, & \text{otherwise} \end{cases}$$
 Then solve the value of k = _____
 A) 1 B) 2 C) 3 D) 4
- Solve the mode of the binomial distribution for which the means is 4 and variance 3 is _____
 A) 2 B) 4 C) 8 D) 3
- If X is Poisson distribution such that $\mu = 2$, Simplify $P(X = 1) =$ _____
 A) 0.9 B) 0.27 C) 0.36 D) 0.4
- Define the statistical constants of the population are called _____
 A) Statistic B) Parameter C) Sample statistic D) none
- Choose The finite population correction factor is _____
 A) $\frac{N-n}{N-1}$ B) $\sqrt{\frac{N-n}{N-1}}$ C) $\frac{N-1}{N-n}$ D) $\sqrt{\frac{N-1}{N-n}}$

Answer All fill in the blank questions.

Marks: 6Qx1/2M = 3M

- Evaluate $\text{GCD}(a,b) =$ _____
- Sum of two odd integers is an _____
- If X is a random variable and $V(X) = 2$ then $V(2X + 3) =$ _____
- If k is constant then $\text{var}(k) =$ _____
- Estimate A coin is tossed 3 times, the probability of obtaining two heads will be _____
- If $\bar{X} = 157, \mu = 155, \sigma = 15$ and $n = 36$ then solve Z is _____

P.T.O

Marks: 2Qx1M = 2M

Answer All Match the following questions.

17.	1. GCD	A)	Self-inverse	II	CO3
	2. LCM	B)	Greatest Common Divisor		
	3. If $p = 2^n - 1$ Then n is	C)	Prime		
	4. If $a^2 \equiv 1 \pmod{m}$, then Inverse of a	D)	Least Common Multiple		
18.	1. If X is a random variable then $V(aX+b)$	A)	$aE(x) + b$	II	CO2
	2. $V(a)$	B)	$a^2 V(x)$		
	3. $E(ax+b)$	C)	1		
	4. $\sum_{i=1}^n P(x_i)$	D)	0		

Part – BAnswer any FOUR questions.

Marks: 4Qx5M = 20M

19. What is the greatest common divisor (GCD) of 143,227. V CO1
20. Find the GCD of 45 and 126 and express it in the form $45x+126y$ where x and y are integers. I CO1
21. Compute GCD (858,728,325). I CO1
22. A random variable X has the following probability function I CO2

X	-3	-2	-1	0	1	2	3
P(X)	K	0.1	K	0.2	2K	0.4	2K

Find i) K ii) Mean iii) variance

23. If X is a normal variate, find the area A I CO2
- to the left of $z = -1.78$
 - to the right of $z = -1.45$
 - Corresponding to $-0.8 \leq z \leq 1.53$
 - to the left of $z = -2.52$ and to the right of $z = 1.83$
24. A population consists of six numbers 4,8,12,16,20,24. Consider all samples of size two which can be drawn without replacement from this population. Illustrate II CO3
- The populations mean.
 - The population standard deviation.
 - The mean of the sampling distribution of means.
 - The standard deviation of the sampling distribution of means.



SRIINDUCOLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution under UGC, New Delhi) - Recognized under 2(f) and 12(B) of UGC Act 1956

II B.Tech. I Semester (Regular) End Examinations, (MODEL PAPER) (R20MTH2104) MATHEMATICAL and STATISTICAL FOUNDATIONS

05/03/2022

(For CS, AIML and DS)

Day-3 (FN)

Duration: 3 Hrs

Maximum Marks: 70M

Blooms Taxonomy: (L1-Remembering, L2-Understanding, L3-Applying, L4-Analyzing, L5-Evaluating and L6-Creating)

Course Outcomes: CO

Answer any FIVE questions from the following.

(5Q x 14M = 70M)

1. For the following set of integers, express the greatest common divisor as a linear combination of these integers (280, 330, 405, 490) L2 CO1

2. Prove that the relation "Congruence mod m" is an equivalence relation. L2 CO1

3. Calculate the regression equation of Y on X from the data given below taking deviations from actual means of X and Y L4 CO2

Price (rs)	10	12	13	12	16	15
Amount demanded	40	38	43	45	37	43

Estimate the likely demand when the price is Rs 20.

4. A random variable X has the following probability function L2 CO3

x	0	1	2	3	4	5	6	7
P(x)	0	K	2K	2K	3K	K ²	2K ²	7K ² +K

- i) Determine K ii) Evaluate $P(X < 6)$, $P(X \geq 6)$, $P(0 < X < 5)$ iii) $P(X \leq K) > \frac{1}{2}$ find the minimum value of K and iv) determine the distribution of X v) Mean vi) Variance

5. Give the Applications of normal distribution. L2 CO4

6. Find 95% confidence limits for the mean of a normally distributed population from which the following sample was taken 15, 17, 10, 18, 16, 9, 7, 11, 13, 14. L2 CO5

7. Explain briefly about the stochastic matrix and the Markov process. L5 CO6
8. a) Define Greatest Common Divisor with an example. L1 CO1
- b) If X is a Poisson variate such that $3P(X=4) = P(X=2) + P(X=0)$, find the mean of X . L4 CO2
- c) Give the applications of normal distribution. L2 CO3
- d) Which of the following are regular matrices? L1 CO6
- i) $\begin{bmatrix} 0 & 0 & 1 \\ \frac{1}{2} & 0 & \frac{1}{2} \\ 0 & 1 & 0 \end{bmatrix}$ ii) $\begin{bmatrix} \frac{1}{2} & \frac{1}{4} & \frac{1}{4} \\ 0 & 1 & 0 \\ \frac{1}{2} & 0 & \frac{1}{2} \end{bmatrix}$ iii) $\begin{bmatrix} \frac{1}{2} & \frac{1}{2} & 0 \\ \frac{1}{2} & \frac{1}{2} & 0 \\ \frac{1}{4} & \frac{1}{4} & 0 \end{bmatrix}$

PREVIOUS MID AND END QUESTION PAPERS

Duration: 90 Mins**Dt: 17-12-2021, Day-2 (FN)****Max Marks: 25M****Section-A****Answer All the questions****Marks: 5Qx1M=5M**

(*L1-Remembering, L2-Understanding, L3-Applying, L4-Analyzing, L5-Evaluating, L6-Creating.)

Blooms Taxonomy Levels*	Course Outcomes
-------------------------------	--------------------

- | | | |
|---|------|-----|
| 1. Find the greatest common divisor for the set of integers 5, 25, 75. | (L5) | CO1 |
| 2. State Chinese Remainder Theorem. | (L1) | CO1 |
| 3. What is the probability that a card is drawn at random from the pack of cards may be either king or queen? | (L5) | CO2 |
| 4. Define Binomial distribution and mean of binomial distribution. | (L1) | CO2 |
| 5. Define normal distribution. | (L1) | CO3 |

Section-B**Answer any FOUR questions****Marks: 4Qx5M=20M**

- | | | |
|--|------|-----|
| 6. Show that if p is a prime and a is an integer with $p \nmid a$, then $p \mid a^2$. | (L4) | CO1 |
| 7. Find the solution of the following system of linear congruences. $x + 2y \equiv 1 \pmod{5}$
$2x + y \equiv 1 \pmod{5}$. | (L5) | CO1 |
| 8. State and Prove Fundamental Theorem of Arithmetic. | (L1) | CO1 |
| 9. From a sample of 200 pairs of observation the following quantities were calculated $\sum X = 11.34$, $\sum Y = 20.78$, $\sum X^2 = 12.16$, $\sum Y^2 = 84.96$, $\sum XY = 22.13$ from the above data compute the regression coefficients of the equation $Y = \alpha + \beta X$. | (L5) | CO2 |
| 10. If the probability density of a random variable is given by,
$f(x) = K(1-x^2); 0 < x < 1$ and $f(x) = 0$ otherwise
Find the value of 'K' and the probabilities that a random variable will take on a value:
a) Between 0.1 and 0.2 b) Greater than 0.5. | (L5) | CO2 |
| 11. In a sample of 1000 cases, the mean of a certain test is 14 and standard deviation is 2.5, Assuming the distribution to be normal, find:
a) How many student scores between 12 and 15?
b) How many scores above 18.
c) How many scores below 18. | (L1) | CO3 |

IIB.Tech-ISEmester-IIMidTermExamination, February–
2022(R20MTH2104) MATHEMATICAL and STATISTICAL
FOUNDATIONS (For AMIL, DS and CS)

Duration: 90 Mins

Dt: 15-02-2022, Day-2 (FN)

MaxMarks:25M

Section – A

Answer All the questions

Marks: 5Qx1M=5M

*(L1-Remembering,L2-Understanding,L3-Applying,L4-Analyzing,L5-Evaluating,andL6-Creating.)

*Blooms
Taxonomy
LevelsCourse
Outcomes

- | | | |
|---|------|-----|
| 1. How many different samples of size two can be chosen, from a finite population of size 25? | (L2) | CO4 |
| 2. What is the formula to calculate maximum error of estimate E? | (L1) | CO5 |
| 3. Write the test statistic for difference of two means. | (L5) | CO5 |
| 4. Define the Stochastic matrix. | (L1) | CO6 |
| 5. What is the condition for the regular and non-regular matrices? | (L1) | CO6 |

Section–B Answer

any FOUR questions Marks: 4Qx5M = 20M

- | | | |
|---|------|-----|
| 6. A population consists of six numbers 4, 8, 12, 16, 20, 24. Consider all samples of size two which can be drawn without replacement from this population. Find:
a) The population mean.
b) The population standard deviation.
c) The mean of the sampling distribution of means.
d) The standard deviation of the sampling distribution of means. | (L1) | CO4 |
| 7. Explain the procedure of testing of hypothesis. | (L2) | CO5 |
| 8. A sample of 900 members has a mean of 3.4 cms and S.D 2.61 cm. Is this sample has been taken from a large population with mean 3.25 cm. If the population is normal and its mean is unknown, test the hypothesis and also find the 95% confidence limits of true mean. | (L4) | CO5 |
| 9. In a sample of 1000 people in Karnataka 540 are rice eaters and the rest are wheat eaters. Can we assume that the both rice and wheat are equally popular in this state at 1% level of significance? | (L4) | CO5 |
| 10. Which of the following are regular matrices? | (L1) | CO6 |

$$i) \begin{pmatrix} 0 & 0 & 1 \\ 1 & 0 & \frac{1}{2} \\ 0 & 1 & 0 \end{pmatrix} \quad ii) \begin{pmatrix} \frac{1}{2} & \frac{1}{4} & \frac{1}{4} \\ 0 & 1 & 0 \\ \frac{1}{2} & 0 & \frac{1}{2} \end{pmatrix} \quad iii) \begin{vmatrix} \frac{1}{2} & \frac{1}{2} & 0 \\ 1 & 1 & 1 \\ 2 & -2 & 0 \end{vmatrix} \quad h \frac{1}{4} \quad \frac{1}{4} \quad 0$$

- | | | |
|---|------|-----|
| 11. Which of the following are stochastic matrices? | (L3) | CO6 |
|---|------|-----|

$$i) \begin{pmatrix} 1 & 0 \\ \frac{1}{2} & \frac{1}{2} \end{pmatrix} \quad ii) \begin{pmatrix} \frac{1}{2} & -\frac{1}{2} \\ \frac{1}{4} & \frac{3}{4} \end{pmatrix} \quad iii) \begin{pmatrix} \frac{1}{3} & \frac{2}{3} & \frac{4}{3} \\ \frac{1}{2} & 1 & \frac{1}{2} \end{pmatrix}$$



SRIINDUCOLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution under UGC, New Delhi) - Recognized under 2(f) and 12(B) of UGC Act 1956

IIB.Tech.I Semester(Regular) End Examinations, February–2022.

(R20MTH2104) MATHEMATICAL AND STATISTICAL FOUNDATIONS

05/03/2022
2

(For CS, AIML and DS)

Day 3 (FN)

Duration: 3 Hrs

Maximum Marks: 70M

Blooms Taxonomy: (L1-Remembering, L2-Understanding, L3-Applying, L4-Analyzing, L5-Evaluating and L6-Creating)

Course Outcomes: CO

Answer any FIVE questions from the following.

(5Q x 14M = 70M)

- Prove that a, b , and m be integers with $m > 0$ and $(a, m) = d$. If $d \nmid b$, then $ax \equiv b \pmod{m}$ has no solutions. If $d \mid b$, then $ax \equiv b \pmod{m}$ has exactly d incongruent solutions modulo m . L2 CO1
- Find all integers x and y such that both of the congruences. L2 CO1

$$3x + 4y \equiv 5 \pmod{13} \text{ and } 2x + 5y \equiv 7 \pmod{13}.$$
- The probability that a pen manufactured by a company will be defective is 0.1 if 12 such pens are selected; find the probability that: L4 CO2
 - Exactly 2 will be defective.
 - At least 2 will be defective.
 - None will be defective.
- Derive mean and variance of Poisson distribution. L2 CO2
- The mean weight of 500 students at a certain school is 50 kgs and the standard deviation is 6 kgs. Assuming that the weights are normally distributed, find the expected number of students weighing: L2 CO3
 - Between 40 and 50 kgs.
 - More than 60 kgs.

given that $A(1.6667) = 0.4525$, where $A(z) = \int_0^z \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2}t^2} dt$.
- The average zinc concentration recovered from a sample of zinc measurements in 36 different locations is found to be 2.6 grams per milliliter. Find 95% and 99% confidence intervals for the mean zinc concentration in the river. Assume that L2 CO4

thepopulationstandarddeviationis0.3.

P.T.O.
CO5

7. Find the fixed probability vector for the regular stochastic matrix

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

L5

8. a) Show that if a, b, k and m are integers such that $k > 0, m > 0$ and $a \equiv b \pmod{m}$ then $a^k \equiv b^k \pmod{m}$.

L2 CO1

(4M)

- b) The probability distribution of a finite random variable X is given by the following table:

L4 CO2

(4M)

x_i	-2	-1	0	1	2	3
$P(x_i)$	0.1	k	0.2	$2k$	0.3	k

Find the value of k , mean and variance?

- c) A continuous random variable X has density function given by

L1 CO3

(3M)

$$f(x) = \begin{cases} 2e^{-2x}, & x > 0 \\ 0 & \text{otherwise} \end{cases}$$

Find mean and variance?

- d) Explain about Statistical hypothesis & Null hypothesis.

L1 CO4

(3M)

BR-20

Write Your Ht.No.

D4



SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

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II B.Tech. I Semester (SUPPL.) End Examinations, Aug./Sept. – 2022.

(R20MTH2104) MATHEMATICAL and STATISTICAL FOUNDATIONS

02/09/2022

(For CS, AITML, and DS)

Day- 3 (FN)

Duration: 3 Hrs

Maximum Marks: 70M

Blooms Taxonomy : (I-Remembering, II-Understanding, III-Applying, IV-Analyzing, V-Evaluating and VI-Creating)

Course Outcomes : CO

Answer any FIVE questions from the following.

(5Qx14M = 70M)

1. State and prove Chines remainder theorem. II CO1
2. Find all integers x and y such that both of the congruences.
 $3x + 4y \equiv 5 \pmod{13}$ and $2x + 5y \equiv 7 \pmod{13}$. II CO1
3. Number of telephone lines busy at an instant of time is a binomial variate with probability 0.1 that a line is busy. If 10 lines are chosen at random, what is the probability that: IV CO2
 - a) No line is busy.
 - b) All lines are busy.
 - c) Atleast one line busy.
 - d) Atmost two lines are busy.
4. Derive mean and variance of Binomial Distribution. IV CO2
5. A sample of 12 measurements of the diameter of a metal ball gave the mean $\bar{x} = 7.38\text{mm}$ with standard deviation $s = 1.24\text{mm}$. Find: II CO3
 - a) 95% and
 - b) 99% confidence limits for the actual diameter.
6. A machine is producing metal pieces that are cylindrical in shape. A sample of these pieces is taken and the diameter are found to be 1.01, 0.97, 1.03, 1.04, 0.99, 0.98, 0.99, 1.01 and 1.03cms. Find the 99% tolerance limits that will contain 95% of metal pieces produced by this machine, assuming an approximate normal distribution. II CO4
7. Find the fixed probability vector for the regular stochastic matrix. V CO5

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

P.T.O.

- | | | | | |
|-------|--|----|-----|------|
| 8. a) | Show that if a, b and c are integers with $(a,b)=(a,c)=1$ then $(a,bc)=1$. | II | CO1 | (4M) |
| b) | Explain briefly Linear Regression. | IV | CO2 | (4M) |
| c) | Find the student's 't' for the following values in a sample of eight:
-4, -2, -2, 0, 2, 2, 3, 3 taking the mean of the population to be zero. | I | CO3 | (3M) |
| d) | Explain unbiased estimator and variance of a point estimator. | I | CO4 | (3M) |

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