A

COURSE FILE REPORT

ON

“Computer Oriented Statistical Methods ”

II B-Tech II Semester

Submitted by

Dr. Y. Sunita Rani

Professor of Mathematics

Department

of

COMPUTER SCIENCE & ENGINEERING

CMR ENGINEERING COLLEGE

(UGC Autonomous)

KANDLAKOYA (V), MEDCHAL (M), R.R.DIST.

A.Y 2023-2024

CMR ENGINEERING COLLEGE

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

COURSE INSTRUCTOR NAME: Dr. Y. SUNITA RANI ACADEMIC.YEAR:2023-24

SUBJECT NAME: Computer Oriented Statistical Methods **CLASS ROOM NO: B-204**

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B.Tech : II YEAR II SEM

SEM START AND SEM END DATES: 19-02-2024 TO 30-06-2024

CONTENTS OF COURSE FILE:

1. DEPARTMENT VISION & MISSION

Vision:

To produce globally competent and industry-ready graduates in Computer Science & Engineering by imparting quality education with the know-how of cutting-edge technology and holistic personality.

Mission:

1. To offer high-quality education in Computer Science & Engineering in order to build core competence for the graduates by laying a solid foundation in Applied Mathematics and program frameworkwith a focus on concept building.
2. The department promotes excellence in teaching, research, and collaborative activities to prepare graduates for a professional career or higher studies.
3. Creating an intellectual environment for developing logical skills and problem-solving strategies, thus developing, an able and proficient computer engineer to compete in the current global scenario.

2. LIST OF PEOs, POs AND PSOs

2.1 Program Educational Objectives (PEO):

PEO 1: Excel in professional career and higher education by acquiring knowledge of mathematical computing and engineering principles.
PEO 2: To provide an intellectual environment for analyzing and designing computing systems for technical needs.
PEO 3: Exhibit professionalism to adapt current trends using lifelong learning with legal and ethical responsibilities.
PEO 4: To produce responsible graduates with effective communication skills and multidisciplinary practices to serve society and preserve the environment.

2.2. Program Outcomes (POs):

Engineering Graduates will be able to satisfy these NBA graduate attributes:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
2. **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
3. **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
4. **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
5. **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
6. **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
7. **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
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
10. **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
11. **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

12. **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.

2.3 Program Specific Outcomes (PSOs):

PSO1: Professional Skills and Foundations of Software development: Ability to analyze, design and develop applications by adopting the dynamic nature of Software developments.
PSO2: Applications of Computing and Research Ability: Ability to use knowledge in cutting edge technologies in identifying research gaps and to render solutions with innovative ideas.

3. COURSE OBJECTIVES AND COURSE OUTCOMES

Course Objectives:

1.Concepts of the probability, types of random variables and probability distributions.

2. Sampling distributions and their properties, concepts on estimation.

3. Concepts on testing the hypothesis concerning to large samples.

4. Different kinds of tests related to small samples and tests concerned to small size.

5. Samples and goodness of fit and independence of attributes using chi-square distribution.

6. Stochastic process and Markov chains**.**

Course Outcomes

CO1	**Analyze** the theory of probability, probability distributions of single and multiple random variables**.(Analyzing)**
CO2	**Evaluate** the mean, variance and discrete probability distributions**.(Evaluating)**
CO3	Examine the continuous probability distributions and fundamental sampling distributions**.(Analyzing)**
CO4	Estimate and test a statistical hypothesis**.(Evaluating)**
CO5	Solve the Markov chains in stochastic processes**.(Applying)**

REVISED Bloom's Taxonomy Action Verbs

Definitions	**I. Remembering**	**II. Understanding**	**III. Applying**	**IV. Analyzing**	**V. Evaluating**	**VI. Creating**
Bloom's Definition	Exhibit memory of previously learned material by recalling facts, terms, basic concepts, and answers.	Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating main ideas.	Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way.	Examine and break information into parts by identifying motives or causes. Make inferences and find evidence to support generalizations.	Present and defend opinions by making judgments about information, validity of ideas, or quality of work based on a set of criteria.	Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions.
Verbs	• Choose • Define • Find • How • Label • List • Match • Name • Omit • Recall • Relate • Select • Show • Spell • Tell • What • When • Where • Which • Who • Why	• Classify • Compare • Contrast • Demonstrate • Explain • Extend • Illustrate • Infer • Interpret • Outline • Relate • Rephrase • Show • Summarize • Translate	• Apply • Build • Choose • Construct • Develop • Experiment with • Identify • Interview • Make use of • Model • Organize • Plan • Select • Solve • Utilize	• Analyze • Assume • Categorize • Classify • Compare • Conclusion • Contrast • Discover • Dissect • Distinguish • Divide • Examine • Function • Inference • Inspect • List • Motive • Relationships • Simplify • Survey • Take part in • Test for • Theme	• Agree • Appraise • Assess • Award • Choose • Compare • Conclude • Criteria • Criticize • Decide • Deduct • Defend • Determine • Disprove • Estimate • Evaluate • Explain • Importance • Influence • Interpret • Judge • Justify • Mark • Measure • Opinion • Perceive • Prioritize • Prove • Rate • Recommend • Rule on • Select • Support • Value	• Adapt • Build • Change • Choose • Combine • Compile • Compose • Construct • Create • Delete • Design • Develop • Discuss • Elaborate • Estimate • Formulate • Happen • Imagine • Improve • Invent • Make up • Maximize • Minimize • Modify • Original • Originate • Plan • Predict • Propose • Solution • Solve • Suppose • Test • Theory

Anderson, L. W., & Krathwohl, D. R. (2001). A taxonomy for learning, teaching, and assessing, Abridged Edition. Boston, MA: Allyn and Bacon.

Action Words for Bloom's Taxonomy

Knowledge	Understand	Apply	Analyze	Evaluate	Create
define	explain	solve	analyze	reframe	design
identify	describe	apply	compare	criticize	compose
describe	interpret	illustrate	classify	evaluate	create
label	paraphrase	modify	contrast	order	plan
list	summarize	use	distinguish	appraise	combine
name	classify	calculate	infer	judge	formulate
state	compare	change	separate	support	invent
match	differentiate	choose	explain	compare	hypothesize
recognize	discuss	demonstrate	select	decide	substitute
select	distinguish	discover	categorize	discriminate	write
examine	extend	experiment	connect	recommend	compile
locate	predict	relate	differentiate	summarize	construct
memorize	associate	show	discriminate	assess	develop
quote	contrast	sketch	divide	choose	generalize
recall	convert	complete	order	convince	integrate
reproduce	demonstrate	construct	point out	defend	modify
tabulate	estimate	dramatize	prioritize	estimate	organize
tell	express	interpret	subdivide	find errors	prepare
copy	identify	manipulate	survey	grade	produce
discover	indicate	paint	advertise	measure	rearrange
duplicate	infer	prepare	appraise	predict	rewrite
enumerate	relate	produce	break down	rank	role-play
listen	restate	report	calculate	score	adapt
observe	select	teach	conclude	select	anticipate
omit	translate	act	correlate	test	arrange
read	ask	administer	criticize	argue	assemble
recite	cite	articulate	deduce	conclude	choose
record	discover	chart	devise	consider	collaborate
repeat	generalize	collect	diagram	critique	collect
retell	give examples	compute	dissect	debate	devise
visualize	group	determine	estimate	distinguish	express
	illustrate	develop	evaluate	editorialize	facilitate
	judge	employ	experiment	justify	imagine
	observe	establish	focus	persuade	infer
	order	examine	illustrate	rate	intervene
	report	explain	organize	weigh	justify
	represent	interview	outline		make
	research	judge	plan		manage
	review	list	question		negotiate
	rewrite	operate	test		originate
	show	practice			propose
	trace	predict			reorganize
	transform	record			report
		schedule			revise
		simulate			schematize
		transfer			simulate
		write			solve
					speculate
					structure
					support
					test
					validate

4. SYLLABUS COPY

UNIT-I: Random Variables
Sample Space, Events, Counting Sample Points, Probability of an Event, Additive Rules, Conditional Probability, Independence, and the Product Rule, Baye's theorem and problems.
Random variables: Discrete and Continuous random variables, Probability Mass and Density functions, Expectation and Variance.

UNIT-II: Probability Distributions
Binomial, Poisson and Normal Distributions. Populations and Samples, Sampling distribution of the Mean (σ- known and unknown), Central limit theorem.

UNIT-III: Estimation and Tests of Hypothesis for Large Samples
Estimation: Point Estimation and Interval Estimation concerning Means for Large Samples.
Tests of Hypothesis: Type–I and Type-II Errors, Hypothesis testing concerning single mean and difference of means and tests of hypothesis concerning to single proportion and difference of proportions.

UNIT-IV: Tests of Hypothesis for Small Samples
Student t-test, Hypothesis testing concerning one mean and two means, F-test and χ^2 test, Goodness of fit, Independence of Attributes.

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.

<u>**TEXT BOOKS:**</u>

1. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Keying Ye, Probability and Statistics for Engineers and Scientists, 9^{th} Ed. Pearson Publishers.-T1
2. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, Khanna Publications.-T2
3. S.D. Sharma, Operations Research, Kedarnath and Ramnath Publishers, Meerut, Delhi.-T3

<u>**REFERENCE BOOKS:**</u>

1. T.T.Soong, Fundamentals of Probability and Statistics for Engineers, John Wiley & Sons Ltd, 2004. – R1

2. Sheldon M Ross, Probability and Statistics for Engineers and Scientists, Academic Press. – R2

5. INDIVIDUAL TIME TABLE (Dr.Y.Sunita Rani)

Time	9:10AM-10:10AM	10:10 AM-11:00AM	11:00 AM-11:50AM	11:50AM-12:40PM	12:40PM-1:20PM	1:20PM-2:20PM	2:20PM-3:10PM	3:10PM-4:00PM
Period Day	I	II	III	IV		V	VI	VII
MON			COSM B			COSM A	COSM C	
TUE	COSM A					COSM C	COSM B	
WED	COSM B			\			COSM A	
THU								
FRI	COSM C							
SAT			COSM A	COSM B			COSM C	

6. SESSION PLAN/LESSON PLAN

TOPICS	SUB TOPICS	NO. OF PERIODS	SUGGESTED BOOKS	TEACHING METHODS
UNIT-I **Probability, Random Variables and Probability Distributions**	Sample Space, Events, Counting Sample points.	L1	T1,T2,R2	M1
	Probability of an event, Additive Rules.	L2,L3	T1,T2,R1	
	Conditional Probability, Independence and the Product Rule	L4,L5,L6	T1,T2,R2	
	Baye's theorem and problems	L7	T1,T2,R2	
	Concept of a random variable.	L8	T1,T2,R2	
	Random Variables	L9	T1,T2,R2	
	Discrete Random Variables	L10	T1,T2,R2	
	Continuous Random Variables	L11,L12	T1,T2,R2	
	Probability Mass and Density Functions Expectation and Variance	L13, L14	T1,R1,R2	
UNIT-II **Probability Distributions**	Binomial Distributions			M11
	Poisson Distributions	L15, L16	T1,T2,R2	
	Fit a Poisson Distribution	L17, L18, L19	T1,T2,R2	
	Normal Distribution	L20, L21	T1,T2,R2	
	Normal distribution, areas under the Normal Curve	L22,L23,L24, L25	T1,T2,,R1,R2	
UNIT-III **Estimation and Tests of Hypothesis for Large Samples**	Applications of the Normal Distribution	L26	T1,T2,,R1,R2	M1
	Normal approximation to the Binomial	L27	T1,T2,,R1,R2	
	Populations and Samples	L28	T1,T2,,R1,R2	
	Sampling distribution of Mean	L29	T1,T2,R2	
	Sampling distribution of proportion	L30	T1,T2,R2	
	Central Limit Theorem	L31	T1,T2,R2	
UNIT-IV **Tests of Hypothesis for Small Samples**	Intervals			M11
	Estimating the variance, Estimating a Proportion for single mean, Difference between two means, between two proportions for two samples and Maximum Likelihood Estimation	L49, L50	T1,R1T2	
	General Concepts, Testing a Statistical Hypothesis, Tests concerning a single mean, Tests on two means	L51,L52	T1,T2	
	Tests on a single proportion, Two samples: Tests on two proportions.	L53, L54	R1,R2,T1	

UNIT - V **Stochastic Processes and Markov Chains**	Introduction to Stochastic processes - Markov process. Transition Probability, Transition Probability Matrix	L55,L56	T1,T2,T3,R1	M1
	First and Higher order Markov process, n-step transition probabilities,	L57	T1,T2,R2	
	Markov chain, Steady state condition, Markov analysis	L58, L59,L60	T1,R1,T2	

METHODS OF TEACHING:

M1:Lecture Method	**M11:Tutorial**
M2:Demo Method	**M12:Assignment**
M3:Guest Lecture	**M13:Industry Visit**
M4:Presentation/PPT	**M14:Project Based Learning**
M5:Mind Map	**M15:Mnemonics**
M6:ATL Lab	**M16:Laboratory Improvement Future Trends**
M7:Group Learning	**M17:Collaborative Learning**
M8:One minute Paper	**M18:Think Pair Share**
M9 :Case Study	**M19:NPTEL Video Lectures**
M10:Flipped Classes	**M20:Innovative Assignment**

7. SESSION EXECUTION LOG:

S no	Unit	Scheduled started date	Completed date	Remarks
1	I	19-02-2024	29-02-2024	COMPLETED
2	II	01-03-2024	23-03-2024	COMPLETED
3	III	25-03-2024	20-04-2024	COMPLETED
4	IV	22-04-2024	01-06-2024	COMPLETED
5	V	02-06-2024	30-06-2024	COMPLETED

8. LECTURE NOTES – (HAND WRITTEN)

9. ASSIGNMENT QUESTIONS ALONG WITH SAMPLE ASSIGNMENTS SCRIPTS

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II.B.TECH II SEM - I MID ASSIGNMENT QUESTIONS **CMREC/CSE/2023-2024**

Subject: Computer Oriented Statistical Methods **BRANCH: CSE**

Answer all 5 questions:

1. Of the three men, the chances that a politician, a business man or an academician will be appointed as a Vice - Chancellor (V.C.) of a university are 0.5, 0.3, 0.2 respectively. The probability that research is promoted by these persons if they are appointed as V.C. are 0.3, 0.7, 0.8 respectively. Determine the probability that research is promoted. If research is promoted, what is the probability that V.C. is an academician? (BL - 5) (CO 1)

2. A continuous random variable has the probability density function

$$f(x) = \begin{cases} kxe^{-\alpha x}, if\ x \geq 0\ and\ \propto \geq 0 \\ 0, \quad elsewhere \end{cases}$$

Determine (i) k (ii) Mean (iii) Variance (BL - 5) (CO 1)

3 a) Four coins are tossed 160 times. The number of times x heads occur is given below

x	0	1	2	3	4
No. of times	8	34	69	43	6

Fit a Binomial distribution to this data on the hypothesis that coins are unbiased. (BL - 4) (CO 2)

b)Find the mean and variance of Poisson distribution. (BL - 1) (CO 2)

4. Find the mean and S.D. of the normal distribution in which 7 % of the items are under 35 and 89 % are under 63. (BL - 1) (CO 2)

5. a) Define Point and Interval Estimation. (BL - 1) (CO 3)

   b)A random sample of size 100 has a standard deviation of 5. What can you say about the maximum error with 95 % confidence.(BL-5) (CO 3)

II.B.TECH II SEM - II MID ASSIGNMENT QUESTIONS **CMREC/CSE/2023-2024**

Subject: Computer Oriented Statistical Methods **BRANCH: CSE**

Answer the following questions

1.An oceanographer wants to check whether the mean depth of the ocean in a certain region is 57.4fathoms, as had previously been recorded. What can he conclude at the level of significance α=0.05, if soundings taken at 40 random locations in the given region yielded a mean of 59.1fathoms with a standard deviation of 5.2 fathoms? Also calculate 95 % confidence interval. (CO3)

2 A). A simple sample of the height of 6400 Englishmen has a mean and a S.D of 2.56inches while a sample of heights of 1600 Australians has a mean of 68.55inches and S.D of 2.52 inches. Do the data indicate the Australians are on the average taller than the Englishmen? (Use α as 0.01). (CO3)

3.Two horses A and B were tested according to the time(in seconds) to run a particular track with thefollowing results .Test whether the two horses have the same running capacity. (CO4)

Horse A	28	30	32	33	33	29	34
Horse B	29	30	30	24	27	29	-

4.A) From the following data , find whether there is any significant liking in the habit of soft drinks among the categories of employees. Use chi-Square distribution test with level of significance 0.05. (CO4).

Soft Drinks	Clerks	Teachers	Officers
Pepsi	10	25	65
Thumsup	15	30	65
Fanta	50	60	30

B) Pumpkins were grown under two experimental conditions. Two random samples of 11 and 9 pumpkins, show the sample standard deviations of their weights as 0.8 and 0.5 respectively. Assuming that the weight distributions are normal, rest the hypothesis that the true variances are equal. (CO4)

5. A) Define Markov chain & Stochastic Matrix. When it is said to be regular. (CO5)

B) Find the equilibrium vector for $P = \begin{bmatrix} 0.5 & 0.2 & 0.3 \\ 0.1 & 0.4 & 0.5 \\ 0.2 & 0.2 & 0.6 \end{bmatrix}$ (CO5)

10. MID EXAM QUESTION PAPERS ALONG WITH SAMPLE ANSWERS SCRIPTS

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II.B.TECH- II-SEM-I MID EXAMINATION Date: Time: 28/04/2024 10:00-12:00 PM

Subject: COSM Branch: Common to CSE Marks: 30 M

Note: Question paper contains two parts, Part - A and Part - B.
Part-A is compulsory which carries 10 marks. Answer all questions in part-A.
Part-B consists of (2 1/2) units. Answer any one full question from each unit. Each question carries 5 marks and may have a, b, c sub questions.

PART-A **5X2=10**

1.State the addition theorem of probability for non - mutually exclusive events A and B. (BL - 1) (CO 1)

2. The probability density function of a continuous random variable X is given by f(x) = $ke^{-|x|}, -\infty < x < \infty$. Show that k = $\frac{1}{2}$. (BL - 2) (CO 1)

3. A fair coin is tossed six times. Find the probability of getting four heads. (BL - 1) (CO 2)

4. If the mean of a Poisson distribution is 3, then Find P (X = 0). (BL - 1) (CO 2)

5. If X is a normal random variable, find the area to the right of z = -1.45. (BL - 1) (CO3)

PART-B **4X5=20**

6. Of the three men, the chances that a politician, a business man or an academician will be appointed as a Vice - Chancellor (V.C.) of a university are 0.5, 0.3, 0.2 respectively. The probability that research is promoted by these persons if they are appointed as V.C. are 0.3, 0.7, 0.8 respectively. Determine the probability that research is promoted. If research is promoted, what is the probability that V.C. is an academician? (BL - 5) (CO 1)

(OR)

7. A continuous random variable has the probability density function $f(x) = \begin{cases} kxe^{-\alpha x}, if\ x \geq 0\ and\ \alpha \geq 0 \\ 0, \quad elsewhere \end{cases}$

Determine (i) k (ii) Mean (iii) Variance (BL - 5) (CO 1)

8. Four coins are tossed 160 times. The number of times x heads occur is given below.

x	0	1	2	3	4
No. of times	8	34	69	43	6

Fit a Binomial distribution to this data on the hypothesis that coins are unbiased. (BL - 4) (CO 2)

(OR)

9. Find the mean and variance of Poisson distribution. (BL - 1) (CO 2)

10. Find the mean and S.D. of the Normal distribution in which 7 % of the items are under 35 and 89 % are under 63. (BL - 1) (CO 3)

(OR)

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
(i) How many students score between 12 and 15?
(ii) How many score above 18?
(iii) How many score below 18? (BL - 1) (CO 3)

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II.B.TECH- II-SEM-II MID EXAMINATION Date: Time: 12/06/2024 10:00-12:00 PM

Subject: COSM Branch: Common to CSE Marks: 30 M

Note: Question paper contains two parts, Part - A and Part - B.
Part-A is compulsory which carries 10 marks. Answer all questions in part-A.
Part-B consists of (2 1/2) units. Answer any one full question from each unit. Each question carries 5 marks and may have a, b, c sub questions.

PART-A 5X2=10

Define Null & Alternative hypothesis. (L1) (CO3)
2. Explain briefly the χ^2(Chi-Square) test. (L4) (CO4)
3. Explain t-distribution.(L4) (CO4)
4. Define stochastic process & Markov chain.(L1) (CO5)
5. If the transition probability matrix is $\begin{bmatrix} 0 & x & \frac{1}{3} \\ 0 & 0 & y \\ \frac{1}{3} & \frac{1}{4} & z \end{bmatrix}$. Find x, y an z ? (L1) (CO5)

PART-B 4X5=20

6.An oceanographer wants to check whether the depth of the ocean in a certain region is 57.4 fathoms, as had previously been recorded. What can he conclude at the level of significance α=0.05, if readings taken at 40 random locations in the given region yielded a mean of 59.1fathoms with a standard deviationof 5.2 fathoms? (CO3)

7. A researcher wants to know the intelligence of students in a school.He selected two groups of students. In the first group there are 150 students having mean IQ of 75 with a S.D of 15. In the second group there are 250 students having mean IQ of 70 with S.D of 20.Is there a significant difference between the means of two groups ? (CO3)

8.A sample of 26 bulbs gives a mean life of 990 hours with a S.D of 20 hours. The manufacturer claims that the mean life of bulbs is 1000 hours. Is the sample not up to the standard. (CO4)

9. The heights of 10 males of a given locality are found to be 70, 67, 62, 68, 61, 68, 70, 64, 64, 66inches. Is it reasonable to believe that the average height is greater than 64inches? Test at 5% significance level assuming that for 9 degrees of freedom (t=1.833 at α=0.05). (CO4)

10.Find the equilibrium vector or steady state vector for the transition matrix $\begin{bmatrix} 0.5 & 0.2 & 0.3 \\ 0.1 & 0.4 & 0.5 \\ 0.2 & 0.2 & 0.6 \end{bmatrix}$ (CO5)

11. The transition probability matrix of a Markov chain $\{x_n\}$,n= 1,2,3 …….
having 3 states 1, 2 and 3 is P= $\begin{bmatrix} 0.1 & 0.5 & 0.4 \\ 0.6 & 0.2 & 0.2 \\ 0.3 & 0.4 & 0.3 \end{bmatrix}$ and the initial distribution is

$P^{(0)} = (0.7 \quad 0.2 \quad 0.1)$.

Find (i) $P(X_2=3)$(ii) $P(X_3=2, X_2=3, X_1=3, X_0=2)$. (CO5)

11. SCHEME OF EVALUATION
MID-1

SCHEME OF EVALUATION

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DESCRIPTIVE TEST - I A.Y: 2023-2024

Branch : CSE **Subject : COSM**
Class : II B.Tech II Sem. **Max marks : 30**
Time : 10.00 AM T0 11-30 AM.

Note: Question paper contains two parts, Part - A and Part - B.
Part - A is compulsory which carries 10 marks. Answer all questions in Part - A.
Part - B consists of ($2\frac{1}{2}$) units. Answer any one full question from each unit. Each question carries 5 marks and may have a,b,c sub questions.

S.No.	THEORY	MARKS	TOTAL
1.	Formula	1	2
	Procedure	0.5	
	Final answer	0.5	
2.	Formula	1	2
	Procedure	0.5	
	Final answer	0.5	
	Formula	1	

3.	Procedure	0.5	2
	Final answer	0.5	
4.	Formula	1	2
	Procedure	0.5	
	Final answer	0.5	
5.	Diagram	1	2
	Calculation	0.5	
	Final answer	0.5	
TOTAL			**10**
6.	Formula	2	5
	Procedure	2	
	Final answer	1	
7.	Formula	2	5
	Procedure	2	
	Final answer	1	
8.	Formula	2	5
	Procedure	2	
	Final answer	1	
9.	Formula	2	5
	Procedure	2	
	Final answer	1	
10.	Diagram	2	5
	Procedure	2	
	Final answer	1	
11.	Formula	2	5
	Procedure	2	
	Final answer	1	
TOTAL			**20**

SCHEME OF EVALUATION
MID-2

DESCRIPTIVE TEST - I A.Y: 2023-2024

Branch : CSE **Subject : COSM**
Class : II B.Tech II Sem. **Max marks : 30**
Time : 10.00 AM T0 11-30 AM.

Note: Question paper contains two parts, Part - A and Part - B.
Part - A is compulsory which carries 10 marks. Answer all questions in Part - A.
Part - B consists of ($2\frac{1}{2}$) units. Answer any one full question from each unit. Each question carries 5 marks and may have a,b,c sub questions.

S.No.	THEORY	MARKS	TOTAL
1.	Formula	1	2
	Procedure	0.5	
	Final answer	0.5	
2.	Formula	1	2
	Procedure	0.5	
	Final answer	0.5	
3.	Formula	1	2
	Procedure	0.5	
	Final answer	0.5	
4.	Formula	1	2
	Procedure	0.5	
	Final answer	0.5	
5.	Diagram	1	2
	Calculation	0.5	
	Final answer	0.5	
TOTAL			**10**
6.	Formula	2	5
	Procedure	2	
	Final answer	1	
7.	Formula	2	5
	Procedure	2	

	Final answer	1	
8.	Formula	2	5
	Procedure	2	
	Final answer	1	
9.	Formula	2	5
	Procedure	2	
	Final answer	1	
10.	Diagram	2	5
	Procedure	2	
	Final answer	1	
11.	Formula	2	5
	Procedure	2	
	Final answer	1	
TOTAL			**20**

12. MAPPING OF COs WITH POs AND PSOs

CO-PO Matrix												
CO's/PO's	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	2	2								
CO2	3	2	2	2								
CO3	3	2	2	2								
CO4	3	2	2	2								
CO5	3	2	2	2								
CO6	3	2	2	2								

13. 3- HIGH, 2-MEDIUM, 1-LOW

CO-PO Matrix												
CO's/PO's	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**P**
C53014.1	3	2	2	2								
C53014.2	3	2	2	2								
C53014.3	3	2	2	2								
C53014.4	3	2	2	2								
C53014.5	3	2	2	2								

Course Outcome (CO)-Program Specific Outcome (PSO) Matrix:

CO-PSO Matrix		
CO's/PSO's	PSO1	PSO2
C53014.1	2	
C53014.2	2	
C53014.3	2	
C53014.4	2	
C53014.5	2	

14. COS,POS,PSOS JUSTIFICATION

CO1	Analyze the theory of probability, probability distributions of single and multiple random variables.(Analyzing)
CO2	Evaluate the mean, variance and discrete probability distributions.(Evaluating)
CO3	Examine the continuous probability distributions and fundamental sampling distributions.(Analyzing)
CO4	Estimate and test a statistical hypothesis.(Evaluating)
CO5	Solve the Markov chains in stochastic processes.(Applying)
PSO1	**Professional Skills and Foundations of Software development:** Ability to analyze, design and develop applications by adopting the dynamic nature of Software developments.
PSO2	**Applications of Computing and Research Ability**: Ability to use knowledge in cutting edge technologies in identifying research gaps and to render solutions with innovative ideas.

Mapping POs with PEOs

		Program Outcome(PO):											
PEOS		1	2	3	4	5	6	7	8	9	10	11	12
	I	X	X										
	II			X	X			X					
	III					X			X				X
	IV						X	X			X	X	

14. ATTAINMENT OF CO’s, PO’s and PSOs (Excel sheet)

15. PREVIOUS YEAR QUESTION PAPERS

Code No.: MA402BS **R20** H.T.No. | | | 8 | R | | | | | | |

CMR ENGINEERING COLLEGE: : HYDERABAD
UGC AUTONOMOUS
II–B.TECH–II–Semester End Examinations (Supply) - February- 2024
COMPUTER ORIENTED STATISTICAL METHODS
(Common to CSE, IT, CSM)

[Time: 3 Hours] **[Max. Marks: 70]**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 20 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART-A **(20 Marks)**

1. a) Define discrete and continuous random variables. [2M]
   b) The probability density function of a continuous random variable X is given by $P(x)=ae^{-|x|}$ where $-\infty\leq x\leq\infty$. Show that $a=\frac{1}{2}$. [2M]
   c) Define geometric distribution. [2M]
   d) If the mean of Binomial distribution is 3 and variance is 9/4, obtain the value of n. [2M]
   e) If z is normally distributed with mean 0 and variance 1, evaluate $P(z \leq 1.64)$. [2M]
   f) Write any two properties of F-distribution. [2M]
   g) Discuss the level of significance. [2M]
   h) Explain the terms null and alternate hypothesis. [2M]
   i) Define Markov chain. [2M]
   j) Define continuous random process. [2M]

PART-B **(50 Marks)**

2. Three machines I, II and III produce 40%,30% and 30% of the total number of items of a factory. The percentages of defective items of these machines are 4%, 2% and 3%. An item is selected at random and found to be defective. Find the probability that it is from i) Machine- I ii) Machine-II iii) Machine-III [10M]

OR

3. If $f(x)=Ke^{-|x|}$ is p. d.f in $-\infty\leq x\leq\infty$, find: i) K ii) the mean iii) Variance. [10M]

4. A random variable X has the following probability distribution [10M]

X	0	1	2	3	4	5	6	7
P(X)	0	K	2K	2K	3K	K^2	$2K^2$	$7K^2$+K

(i) Find the value of K
(ii) Evaluate $P(X<6), P(X\geq 6)$

OR

5. If a Poisson distribution is such that $p(X=1)*\frac{3}{2}=p(X=3)$ then find (i) $p(X\geq 1)$ (ii) $p(X\leq 3)$ [10M]

6. Find the mean and standard deviation of a normal distribution in which 7% of items are under 35 and 89% are under 63. [10M]

OR

7. A population consists of the five numbers 2, 3, 6, 8, and 11. Consider all possible samples of size 2 that can be drawn without replacement from this population. Find [10M]
   (i) The mean of the population.
   (ii) The standard deviation of the population.
   (iii) The mean of the sampling distribution of means.
   (iv) The standard deviation of the sampling distribution of means.

8. A candidate for election made a speech in a city. Among 500 voters from city A, 59.6% are in favour of him where as among 300 voters from city B, 50% are in favour of him. Test the significance between the differences of two proportions at 5% level. [10

OR

9.a) A sample of 900 members has a mean 3.4 cms and S.D 2.61 cms. Is this sample has been taken from a large population of mean 3.25 and S.D 2.61. [5]

b) In a city A 20% of a random sample of 900 school boys had a certain slight physical defect. In another city B 18.5% of a random sample of 1600 school boys had the same defect. Is the difference between the proportions is significant at 0.05 level of significance. [:

10. A training process is considered as a two state Markov chain. If it rains it is considered to be in state 0, and it doesn't rain the chain is in state 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 three days from today assuming that it is raining today. Assume that the Mutual probabilities of state 0 or state 1as 0.4 and 0.6 respectively. [10

OR

11. Consider a three-state Markov chain with the transition matrix. If the initial probabilities [10

$P_0(x)$=(0.2, 0.3, 0.5).

$$P=\begin{pmatrix} 0 & 1 & 0 \\ 0 & 2/3 & 1/3 \\ 1/16 & 15/16 & 0 \end{pmatrix}$$

i. Find the probabilities after two transitions.

ii. Find the limiting probabilities.

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Code No.: MA302BS | R20 | H.T.No. | | | 8 | R | | | | | | |

CMR ENGINEERING COLLEGE: : HYDERABAD
UGC AUTONOMOUS
II–B.TECH–I–Semester End Examinations (Regular) - January- 2022
COMPUTER ORIENTED STATISTICAL METHODS
(CSD)

[Time: 3 Hours] [Max. Marks: 70]

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 20 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART-A (20 Marks)

1. a) If P(A U B) = 4/5, $P(B^C)$ =1/3 and P(A ∩ B) = 1/5. Compute $P(A^C \cap B)$. [2M]
   b) The probability density function of a continuous random variable X is given by $P(x) = y_0\ e^{-|x|}$, where $-\infty < x < \infty$. Prove that $y_0 = \frac{1}{2}$. [2M]
   c) State geometric distribution. [2M]
   d) If the mean of Binomial distribution is 3 and variance is 9/4, obtain the value of n. [2M]
   e) Find the area A under the normal curve to the left of $z = -1.78$. [2M]
   f) Determine the s.d. of the sampling distribution of means of 300 random samples each of size n = 36 are drawn from a population of N = 1500 which is normally distributed with mean μ=22.4 and s.d. σ of 0.048, if sampling is done without replacement. [2M]
   g) A random sample of 10 ball bearings produced by a company have a mean diameter of 0.5060cm with s.d 0.004cm. Evaluate the maximum error with 95% confidence. [2M]
   h) Explain one tail test and two tail test. [2M]
   i) Define stochastic process. [2M]
   j) Show that $v = (b\ \ a)$ is fixed point of the stochastic matrix $\begin{pmatrix} 1-a & a \\ b & 1-b \end{pmatrix}$. [2M]

PART-B (50 Marks)

2. Two cards are selected at random from 10 cards numbered 1 to 10. Evaluate the Probability P that the sum is odd if (a) 2 cards are drawn together, (b) 2 cards are drawn one after the other without replacement , and (c) 2 cards are drawn one after the with replacement. [3+3+4=10M] [10M]

OR

3. A random variable X has the following probability function: [10M]

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

(a) Find the value of k, (b) Evaluate $P(X < 6)$, $P(X \geq 6)$ and $P(0 < X < 5)$.
[2+8=10M]

4. Define random variable. A pair of fair dice is tossed. Let X denote the maximum of the number appearing i.e., $X(a, b) = \max(a, b)$ and Y denotes the sum of the numbers appearing i.e., $Y(a, b) = a + b$. Compute the mean, variance and standard deviation of the distribution. [10M]

OR

5. (a) Given that $P(X = 2) = 45.P(X = 6) - 3.P(X = 4)$ for a Poisson variate X, find the probability that 3 < X < 5. [5M]

(b) A car firm has two cars which it hires out day by day. The number of demands for a car on each day is distributed as Poisson variable with mean 1.5. Calculate the proportion of days on which some demand is refused. [5M]

6. A bus travels between two cities A and B which are 100 miles apart. If the bus has a breakdown, the distance X of the point of breakdown from city A has a uniform distribution U[0, 100]. [6M]
(a) There are service garages in the city A, city B and midway between cities A and B. If a breakdown occurs, a tow truck is sent from the garage closest to the point of breakdown. What is the probability that the tow truck has to travel more than 10 miles to reach the bus,
(b) Would it be more "efficient" if the three service garages were placed at 25, 50 and 75 miles from city A? Explain. [4M]

OR

7. A population consists of the five numbers 3, 6, 9, 15, and 27. Consider all possible samples of size 3 that can be drawn without replacement from this 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. [2+3+2+3=10M] [10M]

8. (a) What is the maximum error can one expect to make with probability 0.90 when using the mean of a random sample of size n = 64 to estimate the mean of a population with $\sigma^2 = 2.56$? [5M]
(b) What is the size of the smallest sample required to estimate an unknown proportion to within a maximum error 0.06 with at least 95% confidence? [5M]

OR

9. An oceanographer wants to check whether the mean depth of the ocean in a certain region is 57.4 fathoms, as had previously been recorded. What can he conclude at the level of significance $\alpha = 0.05$, if soundings taken at 40 random locations in the given region yielded a mean of 59.1 fathoms with a standard deviation of 5.2 fathoms? Also calculate 95% confidence interval. [10M]

10. [10M]
(a) Compute the unique fixed probability vector t of $P = \begin{pmatrix} 0 & 0.75 & 0.25 \\ 0.5 & 0.5 & 0 \\ 0 & 1 & 0 \end{pmatrix}$.
(b) What matrix does P^n approach?
(c) What vector does
$(0.25, \; 0.25, \; 0.5)P^n$ approach? [4+3+3=10M]

OR

11. Suppose an urn A contains 2 white marbles and urn B contains 4 red marbles. At each step of the process, a marble is selected at random from each urn and the two marbles selected are interchanged. Let X_n denote the number of red marbles in urn A after n interchanges.
(a) Find the transition matrix P. [5M]
(b) What is the probability that there are 2 red marbles in urn A after 3 steps. [5M]

****

16. POWER POINT PRESENTATIONS (PPTs)

What is Probability?

Probability is the chance that something will happen - how likely it is that some event will happen.

Sometimes you can measure a probability with a number like "10% chance of rain", or you can use words such as impossible, unlikely, possible, even chance, likely and certain.

Example: "It is unlikely to rain tomorrow".

- **Exhaustive Events:**

The total number of all possible elementary outcomes in a random experiment is known as '*exhaustive events*'. In other words, a set is said to be exhaustive, when no other possibilities exists.

- **Favorable Events:**

The elementary outcomes which entail or favor the happening of an event is known as 'favorable events' i.e., the outcomes which help in the occurrence of that event.

- **Mutually Exclusive Events:**

Events are said to be '*mutually exclusive*' if the occurrence of an event totally prevents occurrence of all other events in a trial. In other words, two events A and B cannot occur simultaneously.

- Equally likely or Equi-probable Events:

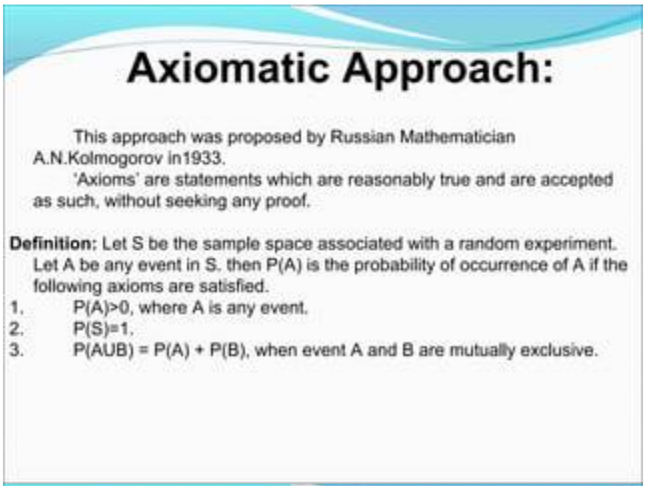
Outcomes are said to be '*equally likely*' if there is no reason to expect one outcome to occur in preference to another. i.e., among all exhaustive outcomes, each of them has equal chance of occurrence.

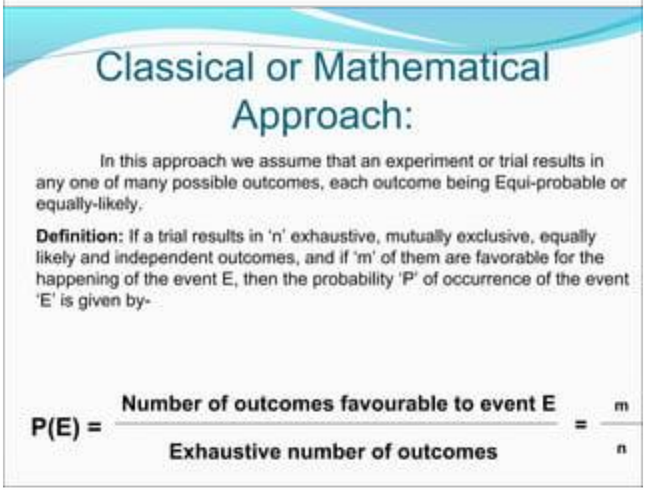
- Complementary Events:

Let E denote occurrence of event. The complement of E denotes the non occurrence of event E. Complement of E is denoted by '**Ê**'.

- Independent Events:

Two or more events are said to be 'independent', in a series of a trials if the outcome of one event is does not affect the outcome of the other event or vise versa.





Power Point Presentations (PPTs):

1. https://www.slideshare.net/mrraymondstats/random-variables
2. https://www.slideshare.net/parthrdx/sqc
3. https://library2.lincoln.ac.nz/documents/Normal-Binomial-Poisson.pdf
4. https://www.slideshare.net/dataminingtools/sampling-distributions
5. https://www.slideshare.net/mohitasija/correlation-and-regression-40667766
6. https://www.slideshare.net/ShinkyJalhotra/queuing-theory-41568797
7. http://slideplayer.com/slide/4850894/

17. Innovative Teaching Methods If Any (Attached Innovative Assignment)

INNOVATIVE ASSIGNMENT :

1 . A businessman goes to hotels X, Y, Z 20%, 50%, 30% of the time respectively. It is known that 5%, 4%, 8% of the rooms in X, Y, Z hotels have faulty plumbing. What is the probability that business man's room having faulty plumbing is assigned to hotel Z . (co-1)

2. The probability density function of a variate X is

X	0	1	2	3	4	5	6
P(X)	k	$3k$	$5k$	$7k$	$9k$	$11k$	$13k$

Find i) $P(X < 4), P(X \geq 5), P(3 < x \leq 6)$

ii) What will be the minimum value of k so that $P(X \leq 2) > 0.3$? (co-1)

3. Using recurrence formula find the probabilities when x=0,1,2,3,4 and 5; if the mean of passion distribution is 3. (co-2)

.

4. Samples of size 2 are taken from the population 3,6,9,15,27 with replacement. 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. (co-3)

5. The marks obtained in Statistics in a certain examination found to be normally distributed. If 15% of the students greater than or equal to 60 marks, 40% less than 30 marks. Find the mean and standard deviation. (co-3

18. References (Textbook/Websites/Journals)

WEBSITES

1. *www.cf.ac.uk/mathssupport/**usefulsites**/index.html*
2. www.stat.fi/isi99/proceedings/arkisto/varasto
3. *www.mathsisfun.com/data/*
4. www.math.uah.edu/stat
5. http://www.youtube.com/watch?v=_oBgnTy85fM
6. http://ocw.mit.edu/courses/mathematics/18-440-probability-and-random-variables-spring-2011/lecture-notes/
7. http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-041-probabilistic-systems-analysis-and-applied-probability-fall-2010/video-lectures/
8. http://freevideolectures.com/Course/2950/Introduction-to-Probability-and-Statistics-Fall-2011

9. http://www.scribd.com/doc/38271591/MIT-Lecture-Notes-on-Probability

JOURNALS

- ACM Transactions on Modeling and Computer Simulation, Association for Computing Machinery (New York)
- Advances and Applications in Statistics, Pushpa Publishing House (Allahabad)
- Advances in Applied Probability, Applied Probability Trust (Sheffield)
- Advances in Statistical Analysis, German Statistical Society, Springer.
- Aligarh Journal of Statistics, The, Aligarh Muslim University (Aligarh, India)
- Allgemeines Statistisches Archiv, German Statistical Society and Physica-Verlag
- American Journal of Epidemiology, Oxford University Press, for the Johns Hopkins Bloomberg School of Public Health