COMPUTER ORIENTED STATISTICAL METHODS

Subject Code: MA303BS

Regulations : R18 - JNTUH

Class: II Year B.Tech CSE I Semester

Department of Computer Science and Engineering

Bharat Institute of Engineering and Technology

Ibrahimpatnam-501510,Hyderabad

COMPUTER ORIENTED STATISTICAL METHODS (MA303BS)
COURSE PLANNER

I. COURSE OVERVIEW:

The students will improve their ability to think critically, to analyze a real problem and solve it using a wide array of mathematical tools. They will also be able to apply these ideas to a wide range of problems that include the Engineering applications.

II. PREREQUISITE:

1. Basic knowledge of Probability.
2. Basic knowledge of Statistics.
3. Basic knowledge of calculation of basic formulas.
4. Basic knowledge of permutations and combinations.
5. Mathematics courses of first year of study.

III. COURSE OBJECTIVE: To learn

1.	The theory of Probability, and probability distributions of single and multiple random variables.
2.	The sampling theory and testing of hypothesis and making inferences.
3.	Stochastic process and Markov chains.

IV.COURSE OUTCOMES:After learning the contents of this paper the student must be able to

No	Description	Bloom's Taxonomy Level
1.	**Understand** the concepts of probability and distributions to some case studies.	L1: Remember L2: Understand
2.	**Evaluate** Mathematical Expectation and Discrete Probability Distributions.	L1: Remember L2: Understand
3.	**Apply** Continuous Normal Distribution and Fundamental Sampling Distributions.	L3: Apply
4.	**Analyze** testing hypothesis of Sample Mean and Sample Proportion.	L3: Apply
5	**Understand** the concept of Stochastic Processes and Markov Chains.	L1: Remember L2: Understand

V. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes		Level	Proficiency Assessed by
PO1	**Engineering knowledge**: To Apply the knowledge of mathematics, science, engineering fundamentals, and Computer Science Engineering to the solution of complex engineering problems encountered in modern engineering	**3**	Assignments, Tutorials and Mock Exams.
PO2	**Problem analysis**: Ability to Identify, formulate, review research literature, and analyze complex engineering problems related to Computer Science reaching substantiated conclusions using first principles of mathematics, natural	**2**	Assignments, Tutorials and Exams.

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	-	--
PO4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis	-	--
PO5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern Computer Science Engineering and IT tools including prediction and modeling	-	--
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	-	--
PO7	**Environment and sustainability**: Understand the impact of Computer Science Engineering professional engineering solutions in societal and environmental contexts, and	-	--
PO8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms ofthe engineering	-	--
PO9	**Individual and team work**: Function effectively as an individual, and as a member or leader indiverse teams, and in multidisciplinary settings.	-	--
PO10	**Communication**: Communicate effectively on complex engineering activities with the engineeringcommunity and with society at large, such as, being able to comprehend and write effective reports and design documentation, make	-	--
PO11	**Project management and finance**: Demonstrate knowledge and understanding of theengineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in	-	--
PO12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage inindependent and life-long	-	--

1: Slight (Low) **2: Moderate (Medium)** **3: Substantial (High)** **4: None**

VI. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes		Level	Proficiency assessed by
PSO1	**ındation of mathematical concepts:** To use mathematical methodologies to crack problem using suitable mathematical analysis, data structure and suitable	**2**	Assignments, Tutorials and Exams.

PSO2	**Foundation of Computer System:** The ability to interpret the fundamental concepts and methodology of computer systems. Students can understand the functionality of	-	--
PSO3	**Foundations of Software development:** The ability to grasp the software development lifecycle and methodologies of software systems. Possess competent skills and knowledge of software design process. Familiarity and practical proficiency with a broad area of	-	--

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) 4: None

VII. SYLLABUS:

UNIT - I

Probability: Sample Space, Events, Counting Sample Points, Probability of an Event, Additive Rules,Conditional Probability, Independence, and the Product Rule, Bayes' Rule.

Random Variables and Probability Distributions: Concept of a Random Variable, Discrete Probability Distributions, Continuous Probability Distributions, Statistical Independence.

UNIT - II

Mathematical Expectation: Mean of a Random Variable, Variance and Covariance of RandomVariables, Means and Variances of Linear Combinations of Random Variables, Chebyshev's Theorem.

Discrete Probability Distributions: Introduction and Motivation, Binomial, Distribution, Geometric Distributions and Poisson distribution.

UNIT - III

Continuous Probability Distributions : Continuous Uniform Distribution, Normal Distribution, Area sunder the Normal Curve, Applications of the Normal Distribution, Normal Approximation to the Binomial, Gamma and Exponential Distributions.

Fundamental Sampling Distributions: Random Sampling, Some Important Statistics, Sampling Distributions, Sampling Distribution of Means and the Central Limit Theorem, Sampling Distribution of S2, t –Distribution, F-Distribution.

UNIT - IV

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.

Statistical Hypotheses: General Concepts, Testing a Statistical Hypothesis, Tests Concerning a Single Mean, Tests on Two Means, Test on a Single Proportion, Two Samples: Tests on Two Proportions.

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.

GATE SYLLABUS:

Section1: Engineering Mathematics

Discrete Mathematics: Propositional and first order logic. Sets, relations, functions, artial orders and lattices. Groups. Graphs: connectivity, matching, coloring. Combinatorics:counting, recurrence relations, generating functions.

Linear Algebra: Matrices, determinants, system of linear equations, eigen values and eigenvectors, LU decomposition.

Calculus: Limits, continuity and differentiability. Maxima and minima. Mean value theorem. Integration.

Probability: Random variables. Uniform, normal, exponential, poisson and binomial distributions. Mean, median, mode and standard deviation. Conditional probability and Bayes theorem.

Section 2: Digital Logic

Boolean algebra. Combinational and sequential circuits. Minimization. Number representations and computer arithmetic (fixed and floating point).

Section 3: Computer Organization and Architecture

Machine instructions and addressing modes. ALU, data-path and control unit. Instruction pipelining.

Memory hierarchy: cache, main memory and secondary storage; I/O interface (interrupt and DMA mode).

Section 4: Programming and Data Structures

Programming in C. Recursion. Arrays, stacks, queues, linked lists, trees, binary search trees, binary heaps, graphs.

Section 5: Algorithms

Searching, sorting, hashing. Asymptotic worst case time and space complexity. Algorithm design techniques: greedy, dynamic programming and divide-and-conquer.Graph search, minimum spanning trees, shortest paths.

Section 6: Theory of Computation

Regular expressions and finite automata. Context-free grammars and push-down automata. Regular
and contex-free languages, pumping lemma. Turing machines and undecidability.

Section 7: Compiler Design

Lexical analysis, parsing, syntax-directed translation. Runtime environments. Intermediate code generation.

Section 8: Operating System

Processes, threads, inter-process communication, concurrency and synchronization. Deadlock. CPU
scheduling. Memory management and virtual memory. File systems.

Section 9: Databases

ER-model. Relational model: relational algebra, tuple calculus, SQL. Integrity constraints, normal forms. File organization, indexing (e.g., B and B+ trees). Transactions and concurrency control.

Section 10: Computer Networks

Concept of layering. LAN technologies (Ethernet). Flow and error control techniques, switching. IPv4/IPv6, routers and routing algorithms (distance vector, link state). TCP/UDP and sockets, congestion control. Application layer protocols (DNS, SMTP, POP, FTP, HTTP). Basics of Wi-Fi. Network security: authentication, basics of public key and private key cryptography, digital signatures and certificates, firewalls.

IES SYLLABUS:

Matrix: Matrix theory, Eigen values & Eigen vectors, system of linear equations

Differential Equations: Numerical methods for solution of non-linear algebraic equations and differential equations

Partial differential equations: Partial derivatives, linear, nonlinear and partial differential equations, initial and boundary value problems

VIII. LESSON PLAN-COURSE SCHEDULE:

Session	Week No	Unit	TOPIC	Course learning outcomes	Teaching Methodologies	Reference
			UNIT – 1			
1.	1	1	Introduction to probability	**Define** probability	Talk & Chalk	T1,T2,R1
2.			Sample Space, Events, Counting Sample Points	**Define** sample point, event and sample space	Talk & Chalk	T1,T2,R1
3.			Probability of an Event, Additive Rules	**Solve** problems on additive rule	Talk & Chalk	T1,T2,R1
4.			Conditional Probability,	**Solve** problems on conditional probability	Talk & Chalk	T1,T2,R1
5.	2		Independence and the Product Rule	**Understand** application of product and independence rule	Talk & Chalk	T1,T2,R1
6.			Problems on probability	**Solve** problems on probability	Talk & Chalk	T1,T2,R1
7.			Bayes’ Rule.	**Solve** problems on bayes theorem	Talk & Chalk	T1,T2,R1
8.			Concept of a Random Variable	**Define** random variable	Talk & Chalk	T1,T2,R1
9.	3		Discrete Probability Distribution	**Solve** problems on discrete probability distribution	Talk & Chalk	T1,T2,R1
10.			Continuous Probability Distribution	**Solve** problems on continuous probability distribution	Talk & Chalk	T1,T2,R1

11.			Problems on distributions	**Solve** problems on probability distributions	Talk & Chalk	T1,T2 ,R1
12.			Statistical Independence	**Solve** problems on statistical independence	Talk & Chalk	T1,T2 ,R1
13.			*** Applications of Expectations of any event (content beyond syllabus)**	**Understand** applications	Talk & Chalk	
			Mock Test – I			
			UNIT – 2			
13	4	2	Mathematical Expectation	**Find** mathematical expectation	Talk & Chalk	T1, T3, R2
14.			Mean of a Random Variable	**Solve** problems on mean	Talk & Chalk	T1, T3, R2
15.			Variance and Covariance of RandomVariables	**Solve** problems of variance and covariance	Talk & Chalk	T1, T3, R2
16.			Means and Variances of Linear Combinations of Random Variables	**Solve** problems on mean and variance of linear combination of random variables	Talk & Chalk	T1, T3, R2
17.	5		Means and Variances of Linear Combinations of Random Variables	**Solve** problems on mean and variance of linear combination of random variables	Talk & Chalk	T1, T3, R2
18			Chebyshev’s Theorem	**Apply** Chebyshev’s Theorem	Talk & Chalk	T1, T3, R2
19			Discrete Probability Distribution	**Find** Discrete Probability Distribution	Talk & Chalk	T1, T3, R2
20.			Introduction and Motivation	**Define** motivation	Talk & Chalk	T1, T3, R2
21.	6		Binomial Distribution	**Apply** Binomial Distribution	Talk & Chalk	T1, T3,

						R2
22.			Geometric Distribution	**Apply** Geometric Distribution	Talk & Chalk	T1, T3, R2
23.		2	Problems on binomial and geometric distribution	**Solve** problems on binomial and geometric distributions	Talk & Chalk	T1, T3, R2
24.			Poisson distribution	**Apply** Poisson distribution	Talk & Chalk	T1, T3, R2
			***Applications of Graplical representations** (content beyond the syllabus)	**Understand** applications	Talk & Chalk	
			Tutorial / Bridge Class # 1			
			UNIT – 3			
25.	7	3	Continuous Probability Distribution	**Find** Continuous Probability Distribution	Talk & Chalk	T2, T3, R1
26.			Continuous Uniform Distribution	**Find** Continuous uniform Probability Distribution	Talk & Chalk	T2, T3, R1
27.			Normal Distribution	**Apply** Normal Distribution	Talk & Chalk	T2, T3, R1
28.			Area sunder the Normal Curve	**Find** areas under the normal curve	Talk & Chalk	T2, T3, R1
29.	8		Applications of the Normal Distribution	**Find** applications of normal distribution	Talk & Chalk	T2, T3, R1
30.			Normal Approximation to the Binomial, Gamma and Exponential Distributions.	**Find** normal approximations to all probability distributions	Talk & Chalk	T2, T3, R1
31			Fundamental Sampling Distribution	**Define** sampling distribution	Talk & Chalk	T2, T3, R1

32.			Random Sampling	**Define** random sampling	Talk & Chalk	T2, T3, R1
			Tutorial / Bridge Class # 2			
			I Mid Examinations			
33.	9	3	Some Important Statistics, Sampling Distributions	**Define** statistics	Talk & Chalk	T2, T3, R1
34.			Sampling Distribution of Means and the Central Limit Theorem	**Apply** central limit theorem	Talk & Chalk	T2, T3, R1
35.			Sampling of S2	**Apply** S2 Distribution	Talk & Chalk	T2, T3, R1
36.			t –Distribution and F-Distribution.	**Apply** t and F Distribution	Talk & Chalk	T2, T3, R1
37			• **Evaluation of surface and volume using MATLAB (**contents beyond the syllabus)	**Understand** application	Talk & Chalk	
UNIT – 4						
38	10	4	Statistical Inference, Classical Methods of Estimation	**Define** inference and classical methods of estimation	Talk & Chalk	T2, R1, R2
39			Estimating the Mean, Standard Error of a Point Estimate	**Find** mean and error of point estimate	Talk & Chalk	T2, R1, R2
40			Prediction Intervals, Tolerance Limits, Estimating the Variance	**Find** intervals and limits of estimate	Talk & Chalk	T2, R1, R2
41			Estimating a Proportion for single mean	**Apply** Estimating a Proportion for single mean	Talk & Chalk	T2, R1, R2
42	11		Difference between Two Means,	**Apply** estimation of difference between two means	Talk & Chalk	T2, R1, R2
43			Two Proportions for Two Samples and Maximum	**Apply** Proportions for Two Samples	Talk & Chalk	T2, R1,

			Likelihood Estimation.			R2
44			General Concepts, Testing a Statistical Hypothesis	**Define** Statistical Hypothesis	Talk & Chalk	T2, R1, R2
45			Tests Concerning a Single Mean	**Apply** Tests Concerning a Single Mean	Talk & Chalk	T2, R1, R2
46			***Tutorial / Bridge Class # 3***			
47	12		Tests on Two Means	**Apply** Tests Concerning a Two Mean	Talk & Chalk	T2, R1, R2
48			Problems on mean test	**Solve** problems on mean testing	Talk & Chalk	T2, R1, R2
49			Test on a Single Proportion	**Apply** Test of Single Proportion	Talk & Chalk	T2, R1, R2
50			Tests on Two Proportions.	**Apply** Test of Two Proportion	Talk & Chalk	T2, R1, R2
51			**Applications of Signals and Systems** (content beyond the syllabus)	**Understand** application	Talk & Chalk	
52			***Mock Test - II***			
UNIT – 5						
53	13	5	Introduction to Stochastic processes	**Define** Stochastic processes	Talk & Chalk	T1, T3, R2
54			Markov process	**Define** Markov process	Talk & Chalk	T1, T3, R2
55			Transition Probability	**Define** Transition Probability	Talk & Chalk	T1, T3, R2
56			Transition Probability Matrix	**Find** Transition Probability Matrix	Talk & Chalk	T1, T3, R2
57	14		Problems on stochastic process	**Solve** problems on stochastic process	Talk & Chalk	T1, T3,

						R2
58			First order Markov process	**Evaluate** First order Markov process	Talk & Chalk	T1, T3, R2
59			Higher order Markov process	**Evaluate** Higher order Markov process	Talk & Chalk	T1, T3, R2
60			n-step transition probabilities	**Find** n-step transition probabilities	Talk & Chalk	T1, T3, R2
61	15		Markov chain	**Define** Markov chain	Talk & Chalk	T1, T3, R2
62			Steady state condition	**Define** Steady state condition	Talk & Chalk	T1, T3, R2
63			Markov analysis	**Understand** Markov analysis	Talk & Chalk	T1, T3, R2
64			Problems on Markov analysis	**Solve** problems on Markov analysis	Talk & Chalk	T1, T3, R2
65			**Applications in Fluid Dynamics and Aerodynamics** (content beyond syllabus)	**Understand** application	Talk & Chalk	
66			***Tutorial / Bridge Class# 4***			
II Mid Examinations						

SUGGESTED BOOKS:

TEXT BOOKS:

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

REFERENCE BOOKS:

1. T.T. Soong, Fundamentals of Probability And Statistics For Engineers, John Wiley & Sons Ltd, 2004.
2. Sheldon M Ross, Probability and statistics for Engineers and scientists, Academic Press.

IX. MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Outcomes	Program Outcomes (PO)												Program Specific Outcomes (PSO)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
I	3	3	-	-	-	-	-	-	-	-	-	-	2	-	-
II	2	2	-	-	-	-	-	-	-	-	-	-	2	-	-
III	3	2	-	-	-	-	-	-	-	-	-	-	2	-	-
IV	3	2	-	-	-	-	-	-	-	-	-	-	2	-	-
V	2	1	-	-	-	-	-	-	-	-	-	-	1	-	-
AVG	2.6	2.0	-	-	-	-	-	-	-	-	-	-	1.8	-	-

1: Slight(Low) **2: Moderate (Medium)** **3: Substantial(High)** **4 : None**

QUESTION BANK: (JNTUH)

DESCRIPTIVE QUESTIONS:

UNIT- I

Short Answer Questions

S.No	Questions	Blooms taxonomy level	Course outcome
1	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><td>7</td></tr><tr><td>P(x)</td><td>0</td><td>k</td><td>2k</td><td>2k</td><td>3k</td><td>k^2</td><td>$2k^2$</td><td>k^2+k</td></tr></table>Find (i) k (ii) P(x<6) (iii) P(x > 6)	Understand	1
2	Let X denotes the minimum of the two numbers that appear when a pair of fair dice is thrown once. Determine (i) Discrete probability distribution (ii) Expectation (iii)Variance.	Understand	1
3	Define Event and Sample space	Remember	1
4	If the probability density function of Random variable $f(x) = k(1 - x^2), 0 < x < 1$ then find (i) k (ii) P[0.1<x<0.2]	Understand	1
5	Find the probability distribution for sum of scores on dice if we throw two dice.	Understand	1

6	State Conditional probability and Bayes theorem.	Remember	1
7	The function $f(x)=Ax^2$, in $0< x <1$ is valid probability density function then find the value of A.	Understand	1
8	State Addition and Product Rules	Remember	1
9	A continuous random variable has the probability density function $f(x) = \begin{cases} kxe^{-\lambda x}, & for\ x \geq 0, \lambda > 0 \\ 0, & otherwise \end{cases}$ Determine (i) k (ii) Mean (iii) Variance.	Understand	1
10	Out of 24 mangoes, 6 mangoes are rotten. If we draw two mangoes, Obtain probability distribution of number of rotten mangoes that can be drawn.	Understand	1

Long Answer Questions

S.No	Questions	Blooms taxonomy level	Course outcome
11	A coin is tossed 9 times. Find the probability of getting five heads.	Understand	1
12	A fair coin is tossed six times. Find the probability of getting four heads.	Remember	1
13	Assume that 50% of all engineering students are good in Mathematics. Determine the probability that among 18 engineering students exactly 10 are good in Mathematics.	Understand	1
14	Average number of accidents on any day on a national highway is 1.8. Determine the probability that the numbers of accidents are at least one.	Understand	1
15	If a bank received on the average 6 bad cheques per day, find the probability that it will receive 4 bad cheques on any given day.	Understand	1
16	20% of items produced from a goods factory are defective. If we choose 5 items randomly then find probability of non defective item.	Understand	1
17	Explain probability mass function and probability density of random variables.	Remember	1
18	Out of 800 families with 5 children each, how many would you expect to have (i)3 boys (ii)5girls (iii)either 2 or 3 boys ? Assume equal probabilities for boys and girls.	Understand	1
19	Average number of accidents on any day on a national highway is 1.8. Determine the probability that the number of accidents is (i) at least one (ii) at most one.	Understand	1
20	A shipment of 20 tape recorders contains 5 defectives find thestandard deviation of the probability	Understand	1

	distribution of the number of defectives in a sample of 10 randomly chosen for inspection.		

UNIT - II

Short Answer Questions

S.No	Questions	Blooms taxonomy level	Course outcome
1	If X is Poisson variate such that P(X=1) = 24P(X=3) then find the mean.	Understand	2
2	If a Poisson distribution is such that *P*(*X* □ 1) □ □*P*(*X* □ 3)then find (i)*P*(*X* □ 1)(ii) *P*(*X* □ 3)(iii) *P*(2 □ *X* □ 5).	Understand	2
3	If X is a random variable then Prove E[X+K]= E[X]+K where 'K' constant.	Understand	2
4	Prove that □ ^{2} □ *E*(*X* ^{2}) □ □ ^{2} .	Understand	2
5	4 coins are tossed 160 times. Fit the Binomial distribution of getting number of heads.	Understand	2
6	Prove that the Poisson distribution is a limiting case of Binomial distribution.	Remember	2
7	Define different types of random variables with example.	Remember	2
8	Explain about Poisson distribution.	Remember	2
9	If f(x)=k *e*$^{□ x}$ is probability density function in the interval, □ □ □*x* □ □, then find i) k ii) Mean iii) Variance iv) P(0<x<4).	Understand	2
10	The variance and mean of a binomial variable X with parameters n and p are 4 and 3. Find i) P(X=1) ii) P(X □ 1) iii) P(0<X<3).	Understand	2

Long Answer Questions

S.No	Questions	Blooms taxonomy level	Course outcome
11	The probability if no misprint in a book is *e*$^{□ 4}$then find probability that a page of book contains exactly two misprints.	Understand	2
12	Determine the binomial distribution for which the mean is 4 and variance 3	Understand	2
13	If X is Discrete Random variable then Prove that Variance (a X +b) = a^{2}Variance(X).	Understand	2

14	Out of 20 tape recorders 5 are defective. Find the standard deviation Of defective in the sample of 10 randomly chosen tape recorders. Find (i) P(X=0) (ii) P(X=1) (iii) P(X=2) (iv) P (1<X<4).	Understand	2
15	A car-hire firm has two cars which it hires out day by day. The number of demands for a car o n each day is distributed as a Poisson distribution with mean 1.5. Calculate the proportion of days (i) no which there is no demand (ii) on which demand is refused.	Understand	2
16	The average number of phone calls per minute coming into a switch board between 2 P.M. and 4 P.M. is 2.5. Determine the probability that during one particular minute (i) 4 or fewer calls (ii) more than 6 calls.	Understand	2
17	Two coins are tossed simultaneously. Let X denotes the number of heads then find i) E(X) ii) $E(X^2)$ iii)$E(X^3)$ iv) V(X).	Understand	2
18	Derive variance of the Poisson distribution.	Remember	2
19	Explain about Binomial distribution.	Remember	2
20	In eight throws of a die 5 or 6 is considered a success. Find the mean number of success.	Understand	2

UNIT - III

Short Answer Questions

S.No	Questions	Blooms taxonomy level	Course outcome
1	If X is normally distributed with mean 2 and variance 0.1, then find P (x □ 2 □ 0.01)?	Apply	3
2	In a Normal distribution, 7% of the item are under 35 and 89% are under 63. Find the mean and standard deviation of distribution.	Apply	3
3	If X is a normal variate with mean 30 and standard deviation 5. Find the probabilities that i) P(26□ X□ 40) ii) P(X □ 45).	Apply	3
4	The mean weight of 500 male students at a certain college is 75kg and the standard deviation is 7kg assuming that the weights are normally distributed find how many students weigh I) Between 60 and 78 kg ii) more than 92kg.	Apply	3
5	The mean and standard deviation of the box obtained by 1000 students in an examination are respectively 34.5 and 16.5. Assuming the normality of the distribution. Find the approximate	Apply	3

	number of students expected to obtain marks between 30 and 60.		
6	Define population? Give an example.	Remember	3
7	Define sample? Give an example.	Remember	3
8	Define parameter and statistic.	Remember	3
9	Prove that Mean = Mode in Normal distribution.	Remember	3
10	Derive median of the Normal distribution.	Remember	3

Long Answer Questions

S.No	Questions	Blooms taxonomy level	Course outcome
11	For a normally distributed variate with mean 1 and standard deviation 3. Find i)P(3.43□ X□ 6.19) ii)P(-1.43□ X□ 6.19).	Apply	3
12	If the masses of 300 students are normally distributed with mean 68 kgs and standard deviation 3 kgs. How many students have masses (i) greater than 72 kg (ii) less than or equal to 64 kg (iii) between 65 and 71 kg inclusive.	Apply	3
13	The marks obtained in Statistics in a certain examination found to be normally distributed. If 15% of the students greater than or equal to60 marks, 40% less than 30 marks. Find the mean and standarddeviation.	Apply	3
14	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 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.	Apply	3
15	If the population is 3, 6, 9, 15, 27 i)List all possible samples of size 3 that can be taken without replacement from the finite population. ii) Calculate the mean of each of the sampling distribution of means. iii) Find the standard deviation of sampling distribution of means.	Apply	3
16	The mean height of students in a college is 155 cms and standard deviation is 15. What is the probability that the mean height of 36 students is less than 157 cms.	Apply	3
17	A random sample of size 100 is taken from an infinite	Apply	

	population having the mean 76 and the variance 256. What is the probability that x will be between 75 and 78.		3
18	A population consists of 5, 10, 14, 18, 13, 24. Consider all possible samples of size two which can be drawn without replacement from this population. Find 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.	Apply	3
19	A population consists of five numbers4, 8, 12, 16, 20, 24. Consider all possible samples of size two which can be drawn without replacement from this population. Find 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.	Apply	3
20	Samples of size 2 are taken from the population 1, 2, 3, 4, 5, 6. Which can be drawn with replacement? Find 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.	Apply	3

UNIT - IV

Short Answer Questions

S.No	Questions	Blooms taxonomy level	Course outcome
1	sample of 64 students have mean weight 70 kg can this be regarded as a sample from population with mean weight 56 kg and S.D 25kg.	Apply	4
2	A sample of 900 members has mean of 3.4 and S.D of 2.61 is this sample has been taken from a large population mean 3.25 and S.D 2.61. Also calculate 95% confidence interval.	Apply	4
3	It is claimed that a random sample of 49 tyres has a mean life of 15200 kms this sample was taken from population whose mean is 15150 kms and S.D is 1200 km test 0.05 level of significant.	Apply	4

4	In 64 randomly selected hour production mean and S.D of production are 1.038 and 0.146 At 0.05 level of significant does this enable to reject the null hypothesis = 1 againist alternative hypothesis : >1.	Apply	4
5	A trucking company rm suspects the claim that average life of certain tyres is at least 28000 miles to check the claim rm puts 40 of this tyres on its truck and gets a mean life time of 27463 miles with a S.D 1348 miles can claim be true.	Apply	4
6	The mean height of 50 male students who participated in sports is 68.2 inches with a S.D of 2.5. The mean height of male students who have not participated in sports is 67.2 inches with a S.D of 2.8. Test the hypothesis that the height of the students who participated in sports more than the students who have not participated in sports.	Apply	4
7	Studying the flow of traffic at two busy intersections between 4pm and 6pm to determine the possible need for turn signals. It was found that on 40 week days there were on the average 247.3 cars approaching the first intersection from the south which made left turn, while on 30 week days there were on the average 254.1 cars approaching the first intersection from the south made left turns . the corresponding samples S.DS are 15.2and 12. Test the significant difference of two means at 5% level.	Apply	4
8	A manufacturer claims that at least 95% of the equipment which he supplied to a factory conformed to specifications. An examination of sample of 200 pieces of equipments received 18 were faulty test the claim at 0.05 level.	Apply	4
9	Among the items produced by a factory out of 500, 15 were defective. In another sample of 400, 20 were defective test the significant difference between two proportions at 5% level.	Apply	4
10	A manufacturer produced 20 defective articles in a batch of 400. After overhauled it produced 10 defective in a batch of 300. Has a machine being improved after over hauling.	Apply	4

Long Answer Questions

S.No	Questions	Blooms taxonomy level	Course outcome
11	A sample of 400 items is taken from a population whose		

	standard deviation is 10.The mean of sample is 40.Test whether the sample has come from a population with mean 38 also calculate 95% confidence interval for the population.	Apply	4
12	The means of two large samples of sizes 1000 and 2000 members are 67.5 inches and 68.0 inches respectively. Can the samples be regarded as drawn from the same population of S.D 2.5 inches.	Apply	4
13	An ambulance service claims that it takes on the average 8.9 minutes to reach its destination In emergency calls. To check on this claim the agency which issues license to Ambulance service has then timed on fifty emergency calls getting a mean of 9.2 minutes with 1.6minutes.What can they conclude at 5% level of significance?	Apply	4
14	Experience had shown that 20% of a manufactured product is of the top quality. In one day's production of 400 articles only 50 are of top quality Test the hypothesis at 0.05 level.	Apply	4
15	According to norms established for a mechanical aptitude test persons who are 18 years have an average weight of 73.2 with S.D 8.6 if 40 randomly selected persons have average 76.7 test the hypothesis: =73.2 against alternative hypothesis : >73.2.	Apply	4
16	A sample of 100 electric bulbs produced by manufacturer 'A' showed a mean life time of 1190 hrs and s .d. of 90 hrs A sample of 75 bulbs produced by manufacturer 'B' Showed a mean life time of 1230 hrs with s.d. of 120 hrs. Is there difference between the mean life times of the two brands at a significance level of 0.05.	Apply	4
17	In a random sample of 60 workers, the average time taken by them to get to work is 33.8 minutes with a standard deviation of 6.1 minutes .Can we reject the null hypothesis □ □ 32.6 minutes in favour of alternative null hypothesis □ □ 32.6at □ □ 0.05 level of significance.	Apply	4
18	On the basis of their total scores, 200 candidates of a civil service examination are divided into two groups; the first group is 30% and the remaining 70%. Consider the first question of the examination among the first group, 40 had the correct answer. Whereas among the second group, 80 had the correct answer. On the basis of these results, can one conclude that the first question is not good at discriminating ability of the type being examined here.	Apply	4
19	A cigarette manufacturing firm claims that brand A line of cigarettes outsells its brand B by 8% .if it is found that 42 out of a sample of 200 smokers prefer brand A and 18 out of another sample of 100 smokers prefer brand B. Test whether 8% difference is a valid claim. .	Apply	4
20	If 48 out of 400 persons in rural area possessed 'cell' phones while 120 out of 500 in urban area. Can it be accepted that the proportion of 'cell' phones in the rural area and Urban	Apply	4

	area is same or not. Use 5% of level of significance.		

UNIT - V

Short Answer Questions

S.No	Questions	Blooms taxonomy level	Course outcome
1	Define Stochastic Process.	Remember	5
2	What is First Passage Time.	Remember	5
3	What is Absorbing State.	Remember	5
4	Define Markov Process.	Remember	5
5	Define First Order Markov Process.	Remember	5
6	Define Higher Order Markov Process.	Remember	5
7	Define Markov Chain.	Remember	5
8	What is Transition Probability.	Remember	5
9	Define Time Inhomogeneous Process.	Remember	5
10	What is parameter estimation	Remember	5

Long Answer Questions

S.No	Questions	Blooms taxonomy level	Course outcome
11	Explain about state space	Understand	5
12	Explain about Discrete Stochastic Variable	Understand	5
13	Explain about Continuous Stochastic Variable	Understand	5
14	Explain about time of Absorption.	Understand	5
15	Explain about Recurrence time.	Understand	5
16	Explain about m-order Markov Process.	Understand	5
17	Explain about Transition Probability Matrix.	Understand	5
18	Explain about n-step Transition Probabilities.	Understand	5
19	Explain about steady state condition.	Understand	5
20	Explain about Markov Analysis.	Understand	5

OBJECTIVE QUESTIONS (JNTUH)

UNIT - I

1. Suppose a fair six-sided die is rolled once. If the value on the die is 1, 2, or 3, the die is rolled a second time. What is the probability that the sum total of values that turn up is at least 6?

   a) 2/3 b) 5/12 c) 10/21 d) 1/6

2. In random experiment, observations of random variable are classified as

a) functions b) trials c) composition d) events

3. Probability distribution of discrete random variable is classified as

a) probability mass function b) interior mass function

c) probability mass function d) continuous mass function

4. Types of probability distributions by taking their functions of considerations must include

a) posterior probability distribution b) discrete probability distribution

c) continuous probability distribution d) both b and c

5. Out of all the 2-digit integers between 1 and 100, a 2-digit number has to be selected at random. What is the probability that the selected number is not divisible by 7?

a) 77/90 b) 12/90 c) 78/90 d) 13/20

6. Value which is obtained by multiplying possible values of random variable with probability of occurrence and is equal to weighted average is called

a) expected value b) weighted value c) cumulative value d) discrete value

7. Tail or head, one or zero and girl and boy are examples of

a) complementary events b) non complementary events

c) functional events d) non-functional events

8. If number of trials are 8 and probability of success are 0.65 then mean of negative probability distribution is

a) 7.35 b) 12.31 c) 8.65 d) 5.20

9. If two fair coins are flipped and at least one of the outcomes is known to be a head, what is the probability that both outcomes are heads?

a) R > 0 b) R > = 0 c) R < 0 d) R = 0

10. If value of p is 0.60 and value of n is 3 whereas random variable x is equal to 4 then value of z-score of distribution is

a) 0.59 b) 1.59 c) 2.59 d) 2.68

11. If X and Y are independent random variable then E(XY)=________

12. Let X be a random variable which is uniformly chosen from the set of positive odd numbers less than 100.then the expectation E(X) is ______________

13. if k is a constant then variance(k)=______

14. A six faced fair dice is rolled a large no. of times the mean of the outcomes is ___

15. Maximum value of a probability is ________

16. The probability of getting a tail in tossing a coil is____________

17. The mean of the probability distribution of the number on face of a die in throwing a die is______________

18. if $f(x)=Ax^2$ in $0 \leq x \leq 1$ is a probability distribution function then A=_____

19. A coin is tossed 3 times. The probability of obtaining two heads will be _________.

20. The mean of the probability distribution of the number of heads obtained in two flips of a balanced coin is a _________

UNIT - II

1. 2600 applications for home mortgage are received by a bank and probability of approval is 0.78 then standard deviation of binomial probability distribution is

a) 446.16 b) 646.16 c) 546.16 d) 2028

2. The mean of the binomial distribution is ________

a) npq b) nq/p c) np /q d) np

3. If the probability of defective bulb is 0.2 then the mean is _____

a) 50 b) 80 c) 100 d) 120

4. In a binomial distribution p=______

a) q b) 1+q c) 1-q d) none

5. In a negative binomial distribution of probability, random variable is also classified as

a) discrete random variable b) continuous waiting time random variable

c) discrete negative binomial variabled) discrete waiting time random variable

6. In Poisson probability distribution, if value of λ is integer then distribution will be

a) positive modal b) bimodal c) unimodal d) negative modal

7. If mean of binomial probability distribution is 25 then mean of Poisson probability distribution is

a) 25 b) 40 c) 50 d) 70

8. A fair coin is tossed six times. Find the probability of getting four heads__

a) 15/64 b) 5/16 c) 3/10 d) none

9. In binomial probability distribution, success and failure generated by trial is respectively denoted by

a) p-q b) p+q c) p and q d) a and b

10. How many possible outcomes are there for a binomial distribution

a) 0 b) 1 c) 2 d) 3

11. The variance of a Poisson distribution is ________
12. A coin is tossed 3 times. The probability of obtaining two heads will be ________
13. The mean of Poisson distribution is_________
14. The mean of binomial distribution is________
15. The value of p in a binomial distribution in terms of q is_________
16. If the mean is 4 and variance is 2 of binomial distribution then p=_________
17. The binomial distribution whose mean is 5 and variance is 10 is__________
18. p+q= ___________ in a binomial distribution
19. If mean of the binomial distribution is 8 and variance is 6 then mode of this distribution is ________
20. The variance of a binomial distribution is ________

UNIT - III

1. If μ is equal to 8 then standard deviation of exponential probability distribution is

a) 0.125 b) 0.225 c) 0.325 d) 0.425

2. In normal distribution the mode is equal to________

a) mean b) median c) a or b d) a&b

3. If z-score of normal distribution is 2.5, mean of distribution is 45 and standard deviation of normal distribution is 3 then value of x for a normal distribution is

a) 37.5 b) 47.5 c) 67.5 d) 97.5

4. Considering normal distribution, spread is increased and height of curve is decreased for

a) smaller value of variance b) smaller value of standard deviation

c) larger value of variance d) larger value of standard deviation

5. The function f(x)=kx in 0<x<1 is a valid probability density function if k= __

a) 1 b) 2 c) 3 d) 4

6. In standard normal probability distribution, z-score of distribution will be zero if

a) $x = \mu$ b) $x < \mu$ c) $x > \mu$ d) all of above

7. If f(x) =k exp(-x/5),x≥ 0 *is a probability density function, then* $k =$ _______

a) 1/3 b) 1/ c) 1/6 d) none

8. If μ is equal to 25 then value of mean for exponential probability distribution is

a) 0.04 b) 0.07 c) 0.08 d) 0.40

9. Find E(X) for the probability density function $f(x) = \begin{cases} \frac{1}{8} & (x+1), 2 < x < 4 \\ 0 & otherwise \end{cases}$

a) 2.063 b) 3.069 c) 3.083 d) none

10. In a random variables V(aX+b) = ________

a) aV(X)+b b) $a^2V(X)$ c) $a^2V(X)$ +b d) none

11. The mean of gamma distribution is _________

12. The variance of gamma distribution is_______

13. If μ=5 and σ=2the equation of normal distributions is ______

14. The mean of exponential distribution is ___________

15. The area under the whole normal curve is ____________

16. The distribution in which mean,median,mode are equal is________

17. The variance of exponential distribution is_______

18. If X be a normal variate with mean 10 and variance 4 then p(X<11)=________

19. In the standard normal curve the area between z= -1 and z=1 is nearly ________

20. In a normal distribution mean deviation: standard deviation=_____________

UNIT - IV

1. The value set for α is known as

a. the rejection level b. the acceptance level

c. the significance level d. the error in the hypothesis test

2. The hypothesis that an analyst is trying to prove is called the

a. elective hypothesis b. alternative hypothesis

c. optional hypothesis d. null hypothesis

3. A type II error occurs when

a. the null hypothesis is incorrectly accepted when it is false
b. the null hypothesis is incorrectly rejected when it is true
c. the null hypothesis is incorrectly rejected when it is true
d. the test is biased

4. Suppose a 95% confidence interval for the proportion of Americans who exercise regularly is 0.29 to 0.37. Which one of the following statements is FALSE?
   a). It is reasonable to say that more than 25% of Americans exercise regularly.
   b). It is reasonable to say that more than 40% of Americans exercise regularly.
   c). The hypothesis that 33% of Americans exercise regularly cannot be rejected.
   d). It is reasonable to say that fewer than 40% of Americans exercise regularly.
5. In hypothesis testing, a Type 2 error occurs when
   a). The null hypothesis is not rejected when the null hypothesis is true.
   b). The null hypothesis is rejected when the null hypothesis is true.
   c). The null hypothesis is not rejected when the alternative hypothesis is true.
   d). The null hypothesis is rejected when the alternative hypothesis is true.
6. By taking a level of significance of 5% it is the same as saying
   a) We are 5% confident the results have not occurred by chance
   b) We are 95% confident that the results have not occurred by chance
   c) We are 95% confident that the results have occurred by chance
   d) None of the above
7. Two types of errors associated with hypothesis testing are Type I and Type II. Type II error is committed when
   a) We reject the null hypothesis whilst the alternative hypothesis is true
   b) We reject a null hypothesis when it is true
   c) We accept a null hypothesis when it is not true
   d) all the above
8. For a random sample of 9 women, the average resting pulse rate is x= 76 beats per minute, and the sample standard deviation is s= 5. The standard error of the sample mean is
   a)0.557 b)0.745 c)1.667 d)2.778
9. Which of the following is true of the null and alternative hypotheses?
   a) Exactly one hypothesis must be true b) both hypotheses must be true
   c) It is possible for both hypotheses to be true d) It is possible for hypothesis to be true
10. A null hypothesis can only be rejected at the 5% significance level if and only if:
    a) A 95% confidence interval includes the hypothesized value of the parameter
    b) A 95% confidence interval does not include the hypothesized value of the parameter
    c) The null hypothesis is void d) An alternative hypothesis is void
11. Null hypothesis is defined as_______
12. Alternate hypothesis is defined as________
13. Type II error in hypothesis testing is_________
14. A hypothesis is true but rejected this is an error of type________
15. A single tail test is used when _________

16. A die is thrown 256 times an even digit turns up 150 times then die is ______
17. A die is thrown 100 times an even digit turns up 10 times then die is ______
18. Random sample of 400 products contains 52 defective items standard error of proportion is________
19. A hypothesis is false but accepted this is an error of type________
20. 500 eggs are taken from a large consignment and 50 are found spoiled standard error of proportion is________

UNIT - V

1. The collection of all sample functions constitutes _____of a random process
   a) statistical mean b) ensemble c) variance d)none
2. A random process can be characterized by _______ averages
   a) 1 b) 2 c) 3 d)none
3. Practically, no process is _______ stationary
   a) wide sense b) normal sense c) strict sense d) none
4. A stochastic variable which takes finite number of values is called _______
   a) discrete b) continuous c) gaussian d) none
5. A markov process is ___if the transition probabilities are independent of time
   a) homogeneous b) non homogeneous c) time homogeneous d) none
6. A markov process is _____ if the state space is discrete
   a) markov analysis b) markov chain c) markov recurrence d) none
7. Stochastic process is also known as _______ process
   a) statistic b) parameter c) random d) none
8. A stochastic variable which takes range of values is called _______
   a) discrete b) continuous c) gaussian d) none
9. In general, the ensemble averages and time averages of a random process are _____
   a) moderate b) same c) different d) none
10. The random process is a random variable which is _______on time
    a) independent b) dependent c) statistical d)none
11. The random process at a particular time instant is a ___________
12. A markov process is defined as ______
13. The time of absorption is ___________
14. A markov chain is defined as ________
15. The transition probability is defined as_________
16. A stationary random process is defined as ______
17. The recurrence time of a random process is _____
18. A random process with time averages equal to ensemble averages is referred to as ______ process
19. A markov analysis is defined as ______
20. A true strict sense random process ranges from ______ to ______

WEBSITES:

1. www.geocities.com/siliconvalley/2151/matrices.html
2. www.mathforum.org/key/nucalc/fourier.html
3. www.mathworld.wolfram.com
4. www.eduinstitutions.com/rec.htm
5. www.isical.ac.in
6. http://nptel.ac.in/courses/111108066/
7. http://nptel.ac.in/courses/111106051/
8. http://nptel.ac.in/courses/111102011/
9. http://nptel.ac.in/syllabus/syllabus.php?subjectId=111103019

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JOURNALS:

INTERNATIONAL

1. Journal of American Mathematical Society
2. Journal of differential equations - Elsevier
3. Pacific Journal of Mathematics
4. Journal of Australian Society
5. Bulletin of “The American Mathematical Society”
6. Bulletin of “The Australian Mathematical Society”
7. Bulletin of “The London Mathematical Society”

NATIONAL

1. Journal of Interdisciplinary Mathematics
2. Indian Journal of Pure and Applied Mathematics
3. Indian Journal of Mathematics
4. Proceedings of Mathematical Sciences
5. Journal of Mathematical and Physical Sciences.
6. Journal of Indian Academy and Sciences

LIST OF TOPICS FOR STUDENT SEMINARS:

1. Orthogonal trajectory.
2. Natural law of growth and decay.
3. Newtons law of cooling.
3. Evaluation of double and triple integration.
4. Geometrical interpretation of curl and divergent.

CASE STUDIES / SMALL PROJECTS:

1. Describe about the Quadratic forms and its nature.
2. Discuss about the Concept of simple harmonic motion and electrical circuits in detail.
3. Describe about the geometrical meaning of double and triple integration.
4. Discuss about the orthogonal trajectory with examples.
5. Discuss the applicability of vector integral theorem.