PROBABILITY AND STATISTICS & COMPLEX VARIABLES (MA301BS)

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 Statistical concepts.
3. Basic knowledge of Differentiation and Integration.
4. Basic knowledge of calculation of basic Complex variables.

III. COURSE OBJECTIVE: To learn

1.	The ideas of probability and random variables and various discrete and continuous probability distributions and their properties
2.	The basic ideas of statistics including measures of central tendency, correlation and regression
3.	The statistical methods of studying data samples.
4.	Differentiation and integration of complex valued functions.
5.	Evaluation of integrals using Cauchy's integral formula and Cauchy's residue theorem.
6.	Expansion of complex functions using Taylor's and Laurent's series

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

S. No	Description	Bloom's Taxonomy Level
1.	Understand the basic terms of Probability and solve problems involving random variables.	Understand, Apply (Level 2, Level 3)
2.	The ability to construct and express the Probability Distributions and Density functions.	Understand, Apply (Level 2, Level 3)
3.	Formulate and apply statistical methods for analyzing for Testing of Hypothesis	Apply, Create (Level 4, Level 6)
4.	Analyze the complex function with reference to their analyticity, integration using Cauchy's integral and residue theorems	Analyze, Apply (Level 4, Level 3)
5.	Taylor's and Laurent's series expansions of complex function.	Understand, Apply (Level 2, Level 3)

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 Mechanical Engineering to the solution of complex engineering problems encountered in modern engineering	**3**	Assignments and Tutorials.
PO2	**Problem analysis**: Ability to Identify, formulate, review research literature, and analyze complex engineering problems related to Mechanical Engineering reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	**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 the cultural, societal, and environmental considerations.	**3**	Assignments, Tutorials and Exams.
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.	**2**	Assignments, Tutorials and Mock Exams.
PO5:	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern Mechanical 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 Mechanical Engineering professional engineering practice.	-	--
PO7:	**Environment and sustainability**: Understand the impact of Mechanical Engineering 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	-	--
PO9:	**Individual and team work**: 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	-	--
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.	1	Oral Tests

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	**Professional Skills:** The student will be able to apply the knowledge of Mathematics, Sciences and engineering fundamentals to formulate, analyze and provide solutions to the problems related to Mechanical engineering and communicate them effectively to the concerned.	**2**	Assignments, Tutorials and Exams.
PSO2	**Problem-Solving Skills:** Design mechanical systems in various fields such as machine elements, thermal, manufacturing, industrial and inter-disciplinary fields by using various engineering/technological tools to meet the mercurial needs of the industry and society at large.	**1**	Assignments, Tutorials and Mock Exams.
PSO3	**Practical implementation and testing skills:** The ability to grasp the latest development, methodologies of mechanical engineering and possess competent knowledge of design process, practical proficiencies, skills and knowledge of programme and developing ideas towards research.	**-**	--

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

VII. SYLLABUS:

UNIT-I: Basic Probability

Probability spaces, conditional probability, independent events, and Bayes' theorem,Random variables: Discrete and continuous random variables, Expectation of Random Variables, Moments, Variance of random variables.

UNIT-II: Probability distributions

Binomial, Poisson, evaluation of statistical parameters for these distributions,
Poisson approximation to the binomial distribution, Continuous random variables and their properties, distribution functions and density functions,Normal and exponential, evaluation of statistical parameters for these distributions.

UNIT-III: Testing of Hypothesis

Test of significance: Basic of testing of Hypothesis. Null and alternate Hypothesis, types of errors, level of significance, critical region. Large sample test for single proportion, difference of proportions, single mean, difference of means ;small sample tests: Test for single mean, difference of means and test for ratio of variances.

UNIT-IV: Complex Variables (Differentiation)

Limit, Continuity and Differentiation of Complex functions, Analyticity, Cauchy-Riemann equations (without proof), finding harmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm) and their properties.

UNIT-V: Complex Variables (Integration)

Line integral, Cauchy's theorem, Cauchy's Integral formula, Zeros of analytic functions, Singularities, Taylor's series, Laurent's series; Residues, Cauchy Residue theorem, Conformal mappings, Mobius transformations and their properties

GATE SYLLABUS:

Basic Probability

Probability spaces, conditional probability, independent events, and Bayes' theorem, Random variables: Discrete and continuous random variables, Expectation of Random Variables, Moments, Variance of random variables.

Probability distributions

Binomial, Poisson, evaluation of statistical parameters for these distributions,
Poisson approximation to the binomial distribution, Continuous random variables and their properties, distribution functions and density functions, Normal and exponential, evaluation of statistical parameters for these distributions.

Complex Variables (Differentiation)

Limit, Continuity and Differentiation of Complex functions, Analyticity, Cauchy-Riemann equations (without proof), finding harmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm) and their properties.

Complex Variables (Integration)

Line integral, Cauchy's theorem, Cauchy's Integral formula, Zeros of analytic functions, Singularities, Taylor's series, Laurent's series; Residues, Cauchy Residue theorem, Conformal mappings, Mobius transformations and their properties.

VIII. LESSON PLAN-COURSE SCHEDULE:

Lecture No.	Week No	Unit	TOPIC	Link for Pdf	Link for PDF	Link for Small Projects/ Numericals(if any)	Course learning outcomes	Reference
1.	1	1	Sample spaces, Types of Events	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy**	**Understand** sample spaces and events	T1,T2,R1
2.			Conditional probability	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy**	**Apply** Conditional probability	T1,T2,R1

3.			Problems	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy**	**Apply** Conditional probability	T1,T2,R1
4.			Baye's theorem	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy**	**Apply** Baye's theorem	T1,T2,R1
5.	2		Problems	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**		**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy**	**Apply** Baye's theorem	T1,T2,R1

6.			Random variables: Discrete r.v	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy**	**Understand** Random variables	T1,T2,R1
7.			Continuous random variables	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy**	**Understand** Random variables	T1,T2,R1

8.			Problems	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy**	**Apply** Random variables	T1,T2,R1
9.	3		Expectation of Random Variables	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy**	**Evaluate** Random variables	T1,T2,R1
10.			Moments: Central moments	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy**	**Evaluate & Apply** Random variables	T1,T2,R1

11.			Moments: Raw moments	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy**	**Evaluate & Apply** Random variables	T1,T2,R1
12.			***Mock test-1***			**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy**		
Unit – II : Probability distributions								
13.	4	2	Binomial distribution- Evaluation of statistical parameters	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfyo?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy**	**Understand & Evaluate** Binomial distribution	T1,T2,R1
14.			Problems	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sh**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy**	**Apply** Binomial distribution	T1,T2,R1

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15.			Poisson distribution-Evaluation of statistical parameters	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy**	**Understand & Evaluate** Poisson distribution	T1,T2,R1
			Bridge class-1					
16.	5		Problems	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy**	**Apply** Poisson distribution	T1,T2,R1

17.			Poisson approximation to the B.D	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy**	**Evaluate P.D with B.D**	T1,T2,R1
18			Distribution functions and density functions	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**Understand** Distribution functions and density functions	T1,T2,R1
19.			***Bridge class-2***					
20.			Normal distribution-Evaluation of statistical parameters	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**Understand & Evaluate** Normal distribution	T1,T2,R1

21.	6		Problems	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**Apply** Normal distribution	T1,T2,R1
22.			Exponential distribution-Evaluation of statistical parameters	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**Understand & Evaluate** Exponential distribution	T1,T2,R1
			Bridge class-3					
Unit – III : Testing of Hypothesis								
23.	7	3	Test of significance: Basics of testing of hypothesis, types of errors, level of significance, critical region.	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**Understand** Test of Hypothesis	T1,R1,R2

24.			Test of significance(Large samples): Test for single proportion.	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**Evaluate** Test for single proportion.	T1,R1,R2
25.			Test for difference of proportions.	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**Evaluate** Test for difference of proportions	T1,R1,R2
			Bridge class-4					
26.	8		Problems	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**Apply** Test for difference of proportions	T1,R1,R2

27.			Test for single mean	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**Evaluate** Test for single mean	T1,R1,R2
28.			Test for difference of means	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**Evaluate** Test for difference of means	T1,R1,R2
			Bridge class-5					

29.			Problems	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**Apply** Test for difference of means	T1,R1,R2
30.	9		Test of significance(Small samples): Test for single mean(Student's t- Test)	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**Understand** Test for single mean	T1,R1,R2
31.			Test for difference of means	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**Evaluate** Test for difference of means	T1,R1,R2
			Bridge class-6					

32.			Test for ratio of variances (F-Test)	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**Evaluate** Test for ratio of variances	T1,R1,R2
			UNIT-IV: Complex Variables (Differentiation)					
33.	10	4	Limits, Continuity of Complex functions	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**Evaluate** Limits & continuity	T3,R4,R5
34.			Differentiation of Complex functions	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**Evaluate** Differentiation of Complex functions	T3,R4,R5

			Bridge class-7					
35.	11		Analyticity of Complex functions	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**Understand** Analyticity	T3,R4,R5
36.			Cauchy-Riemann equations (without proof)	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**Evaluate** C-R equations	T3,R4,R5
37.			Problems	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**Apply** C-R equations	T3,R4,R5
			Bridge class-8					

38.	12		Harmonic conjugate	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**Understand** Harmonic conjugate	T3,R4,R5
39.			Problems	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**Apply** Harmonic conjugate	T3,R4,R5
40.			Elementary analytic functions (exponential, trigonometric,logarithm) and their properties	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**Apply** Elementary analytic functions	T3,R4,R5
			Bridge class-9					

41.			Problems	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**Apply** Elementary analytic functions	T3,R4,R5
			UNIT-V: Complex Variables (Integration)					
42.	13	5	Line integral	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**Understand** Line integral	T3,R4,R5
43.		5	Cauchy's theorem	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**Understand** Cauchy's theorem	T3,R4,R5

44.	14		Cauchy's Integral formula	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**Evaluate** Cauchy's Integral formula	T3,R 4,R5
45.			Problems	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**Apply** Cauchy's Integral formula	T3,R 4,R5
46.			Zeros of analytic functions with Problems	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**Understand & Apply** Zeros of analytic functions	T3,R 4,R5
			Bridge class-10					

47.			Singularities	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**Understand** Singularities	T3,R4,R5
48.			Problems	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**Evaluate** Singularities	T3,R4,R5
49.			Taylor's series	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**Understand** Taylor's series	T3,R4,R5
			Bridge class-11					

50.	15		Problems	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**Evaluate** Taylor's series	T3,R4,R5
51.			Laurent's series	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**Understand** Laurent's series	T3,R4,R5
52.			Problems	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**Evaluate** Laurent's series	T3,R4,R5
			Bridge class-12					

53.			Residues, Cauchy Residue theorem	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**Understand & Evaluate** Residues	T3,R4,R5
54.			Conformal mappings	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**Understand** Conformal mappings	T3,R4,R5
55.			Mobius transformations and their properties	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**https://drive.google.com/drive/folders/1IHh13CrSJ_KZXvp2YinMS6eDsyLOfy-o?usp=sharing**	**Evaluate** Mobius transformations	T3,R4,R5
			Bridge class-13					
			Mid- II Examinations					

SUGGESTED BOOKS:

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2010.
2. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, keying Ye, Probability and statistics for engineers and scientists, 9thEdition, Pearson Publications.
3. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., Mc-Graw Hill, 2004

REFERENCES:

1. Fundamentals of Mathematical Statistics, Khanna Publications, SC.Gupta and V.K. Kapoor.
2. Miller and Freund's, Probability and Statistics for Engineers, 8th Edition, Pearson Educations
3. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.
4. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006.
5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications.

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	2	2	2	-	-	-	-	-	-	-	1	2	1	-
II	3	2	2	2	-	-	-	-	-	-	-	1	2	1	-
III	2	2	2	1	-	-	-	-	-	-	-	1	1	1	-
IV	3	3	2	2	-	-	-	-	-	-	-	1	2	1	-
V	3	2	2	2	-	-	-	-	-	-	-	1	2	1	-
AVG	2.8	2.2	2	1.8								1	1.8	1.0	-

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

QUESTION BANK: (JNTUH)

UNIT - 1

<table>
<tr><th>S.No</th><th>Question</th><th>Blooms taxonomy level</th><th>Course outcome</th></tr>
<tr><td>1</td><td>In a class, 2% of the boys and 3% of girls are having blue eyes. There are 70% boys in the glass. A student is selected and having blue eyes. What is the probability that the student is girl?</td><td>Understand</td><td>1</td></tr>
<tr><td>2</td><td>Of the three men, the chances that a politician or businessman or an academician will be appointed as V.C of a university are 0.5, 0.3, and 0.2 respectively. Probabilities that these three persons promote research in the university, if they are appointed as V.C, are 0.3, 0.7, and 0.8 respectively. Determine i) The probability that the research ispromoted. ii) If research is promoted,what is the probability that V.C is politician?</td><td>Understand</td><td>1</td></tr>
<tr><td>3</td><td>State the axioms of probability of an event. State and prove addition theorem of probability.</td><td>Apply</td><td>1</td></tr>
<tr><td>4</td><td>Find the first four moments for the set of numbers 2,4,6,8.</td><td>Apply</td><td>1</td></tr>
<tr><td>5</td><td>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>$7K^2+k$</td></tr>
</table>
Find (i) the probability that X lies between 0 and 5 (ii) mean of X.</td><td>Apply</td><td>1</td></tr>
<tr><td>6</td><td>What is the probability for a leap year to have 52 Mondays and 53 Sundays?</td><td>Apply</td><td>1</td></tr>
<tr><td>7</td><td>Box A contains 5 red and 3 white marbles and box B contains 2red and 6 white marbles. If a marble is drawn from each box, what is the probability that they are both of same colour?</td><td>Understand</td><td>1</td></tr>
<tr><td>8</td><td>1. A sample of 4 items is selected at random from a box containing 12 items of which 5 are defective. Find the expected number E of defective items.</td><td>Apply</td><td>1</td></tr>
<tr><td>9</td><td>A continuous random variable has the probability density function
$$f(x)=\begin{cases} kxe^{-\lambda x}, for x \geq 0 \\ 0, otherwise \end{cases}$$
Determine (i) k (ii) Mean (iii) Variance</td><td>Apply</td><td>1</td></tr>
<tr><td>10</td><td>Given following probability distribution of X compute 1) E(X) 2) E(2x+3) 3) $E(X^2)$ 4)V(2X+3) 4) V(X)
<table>
<tr><td>X</td><td>-3</td><td>-2</td><td>-1</td><td>0</td><td>1</td><td>2</td><td>3</td></tr>
<tr><td>P(X)</td><td>0.05</td><td>0.10</td><td>0.30</td><td>0</td><td>0.30</td><td>0.15</td><td>0.10</td></tr>
</table></td><td>Apply</td><td>1</td></tr>
</table>

UNIT II

S.No	Question	Blooms taxonomy level	Course outcome
1	In a normal distribution 31% of the items are under 45 and 8% of the items are over 64. Find mean and standard deviation	Apply	2
2	If X is a poisson distribution such that P(X=0) = P(X=2) +3 (X=4) Find (1)The mean of X (2) P (X≤2)	Evaluate	2
3	Suppose the weights of 800 male students are normally distributed with mean $\mu = 140$ pounds and standard deviation is 10 pounds.Find the number of students whose weights are (1) between 138 and 148 pounds (2) more than 152 pounds.	Apply	2
4	20% of items produced from a factory are defective. Find the probability in a sample of 5 chosen at random 1) none is defective 2) one is defective 3) p (1< x < 4)	Evaluate	2
5	Show that the Mean and Variance of Poisson distribution are equal.	Understand	2
6	Show that Poisson is a limiting case of Binomial distribution.	Understand	2
7	Find the probability that atmost 5 defective components will be found in a lot of 200. Experience shows that 2% of such components are defective also find the probability of more than 5 defective components.	Apply	2
8	Derive the Mean and Variance of Normal distribution?	Understand	2
9	Patients arrive at a clinic according to a Poisson distribution at the rate of 30 patients per hour. The waiting room does not accommodate more than 13 patients not including the one i.e., examine. Examination time per patient is exponential with mean rate 20 per hour.(a)Find the effective arrival rate at the clinic. (b)What is the probability that an arriving patient will not wait? What is the probability that he finds a vacant seat in the room? (c)What is the expected waiting until the patient is	Apply	2

	discharged from the clinic?		
10	Suppose the weights of 800 male students are normally distributed with mean28.8 kg and standard deviation of 2.06 kg. Find the number of students whose weights are (i)between 28.4 kg and 30.4 kg (ii)more than 31.3 kg	Apply	2

UNIT III

S.No	Question	Blooms taxonomy level	Course outcome
1	A sample of size *300* was taken whose variance is *225* and means *54* construct *95%* confidence interval for the mean?	Apply	3
2	The guaranteed average life of a battery is 700 days with standard deviation of 60 days. It is required to sample the output so as to ensure that 95% of the batteries do not fall short of guaranteed average life by more than 2.5%.What is the minimum sample size?	Apply	3
3	A random sample of 500 items has mean20 and another sample of size 400 has mean 15.Can you conclude that the two samples are taken from the same population with 4 as Standard deviation.	Apply	3
4	The nine items of a sample had values 45,47,50,52,48,47,49,53,and 51. Does the mean of the nine items differ significantly from the assumed population mean of 47.57	Apply	3
5	A survey of 320 families with 5 children each revealed the following distribution No boys: 5 | 4 | 3 | 2 | 1 | 0 No. of Girls: 0 | 1 | 2 | 3 | 4 | 5 No. of families: 14 | 56 | 110 | 88 | 40 | 12 Is this result consistent with the hypothesis that male and female births are equally probable?	Apply	3
6	Ten specimens of copper wires drawn from a larger lot have the following breaking strength (in kg unit) 518, 572, 570, 568, 572, 578, 570, 572, 569, 548. Test whether the mean breaking strengths of the lot may be taken to be 518 kg weight	Apply	3
7	Prices of shares of a company on the different day in a month were found to be 66, 65, 69, 70, 69, 71, 70, 63, 63, 64 and 68. Discuss whether the mean price of the shared in the month is	Apply	3

	65.		
8	A sample of 40 cam shafts intended for use in gasoline engines has on average eccentricity of 1.02 and a standard deviation of 0.044 inches. The data may be treated a random sample from a normal population. Determine a 99% confidence intervals for the actual mean eccentricity of the cam shaft	Apply	3
9	A lady stenographer claims that she can take the dictation at the rate of 120 words per minute. Can we reject our claim on the basis of 100 trails in which she demonstrates a mean of 116 words with a S.D of 15 words.	Apply	3
10	A random sample of 500 apples was taken from a large consignment and 60 were found to be bad. Obtain 98% confidence interval for the percentage number of bad apples in the consignment	Apply	3

UNIT IV

S.No	Question	Blooms taxonomy level	Course outcome
1	If w = log z, find $\frac{dw}{dz}$ and determine where w is not-analytic.	Understand	4
2	Every analytic function f(z) = u+iv defines two families of curves u(x,y) =k_1 and v(x,y) = k_2 forming an Orthogonal system.	Understand	4
3	Evaluate $\int(z^2+3z)dz$ along the straight line from (2,0) to (2,2) and then from (2,2) to (0,2).	Evaluate	4
4	Find the analytic function of $f(z) = u + iv$ *if* $u - v = e^x(\cos y - \sin y)$	Apply	4
5	S.T $u\,(x, y) = e^{2x}\,(x\cos 2y - y\sin 2y)$ is Harmonic and find its Harmonic conjugate	Apply	4
6	Show that the both Real and Imaginary parts of an Analytic function are Harmonic.	Apply	4
7	Derive the polar form of Cauchy Riemann equation	Evaluate	4
8	Given $u\,(x, y) = e^{2x}(x\cos 2y - y\sin 2y)$, find its Analytic Function	Apply	4
9	Find the analytic function $f(z) = u+iv$ if $u-v = e^x(\cos y - \sin y)$ find f(z) in terms of z.	Apply	4
10	Show that f(x,y) = |xy| is analytic except at origin.	Apply	4

UNIT V

S.No	Question	Blooms taxonomy level	Course outcome
1	Expand $f(z) = \int \frac{1}{z^2-3z+2}$ in the region $1<\|z\|<2$ by Laurent's series.	Apply	5
2	Verify Cauchy's theorem, for $\int Z^3$ dz, taken over the boundary of the rectangle with vertices -1, 1, (1+i), (-1+i)	Apply	5
3	Expand *sinhz* by Taylor's series about $z=\pi i$	Apply	5
4	Evaluate $\oint \frac{4z-3}{z(z-1)(z-2)}$dz, where C is the circle $\|Z\|=\frac{3}{2}$ using Residue Theorem	Apply	5
5	$\int_c \frac{e^{2z}}{(z-1)(z-2)}dz$, *where c is the circle* $\|z\|=3$ by Cauchy residue theorem	Apply	5
6	Verify Cauchy's theorem for the function $f(z) = 3z^2 + iz - 4$ if C is the square with vertices (1 + i) (1 – i) (-1 + i) (-1-i)	Apply	5
7	Determine the poles of the function $\frac{z^2}{(z-1)^2(z+2)}$ and the Residues at each pole.	Apply	5
8	Find the fixed points of the transformation (i) W= $\frac{6z-9}{z}$ (ii) W = $\frac{z-i}{z+i}$	Apply	5
9	Find the Mobius transformation that maps the point (-1,0,1) into the points (0,i,3i)	Apply	5
10	Find the Bilinear transformations which maps (0,1,∞) to (- 1, - 2, -I)	Apply	5

OBJECTIVE QUESTIONS:

UNIT I

1. 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) 13/20 b) 12/90 c) 78/90 d) 77/90

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

3. 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

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

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

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

a) non-functional events b) complementary events

c) non complementary events d) functional events

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

7. 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

8. 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) 1.59 b) 2.59 c) 2.68 d) 0.59

9. Probability distribution of discrete random variable is classified as

a) probability mass function b) probability mass function

c) interior mass function d) continuous mass function

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

a) 8.65 b) 12.31 c) 5.2 d) 7.35

1. A coin is tossed 3 times. The probability of obtaining two heads will be _____.
2. Maximum value of a probability is _____.
3. if $f(x)=Ax^2$ in $0 \leq x \leq 1$ is a probability distribution function then A=_____
4. if k is a constant then variance(k)=_____
5. The mean of the probability distribution of the number of heads obtained in two flips of a balanced coin is a _____.
6. If X an Y are independent random variable then E(XY)=_____

7. 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 _____

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

9. The mean of the probability distribution of the number on face of a die in throwing a die is_____.

10. The probability of getting a tail in tossing a coil is_____.

UNIT II

1. Considering normal distribution, spread is increased and height of curve is decreased for
   a) smaller value of variance b) larger value of variance
   c) larger value of standard deviation d) smaller value of standard deviation

2. If μ is equal to 25 then value of mean for exponential probability distribution is
   a) 0.4 b) 0.08 c) 0.07 d) 0.04

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) 97.5 b) 47.5 c) 37.5 d) 67.5

4. 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

5. 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) 2028 b) 546.16 c) 446.16 d) 646.16

6. If mean of binomial probability distribution is 25 then mean of Poisson probability distribution is
   a) 70 b) 50 c) 25 d) 40

7. 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 waiting time random variable d) discrete negative binomial variable

8. In binomial probability distribution, success and failure generated by trial is respectively denoted by
   a) p and q b) a and b c) p + q d) p – q

9. If μ is equal to 8 then standard deviation of exponential probability distribution is
   a) 0.425 b) 0.125 c) 0.225 d) 0.325

10. In Poisson probability distribution, if value of λ is integer then distribution will be
a) bimodal b) unimodal c) positive modal d) negative modal

1. The mean of the binomial distribution is _____.
   a) np b) npq c) np /q d) nq/p
2. If mean of the binomial distribution is 8 and variance is 6, the mode of this distribution is _____.
3. A coin is tossed 3 times. The probability of obtaining two heads will be _____.
4. The mean and variance of a Poisson distribution are _____.
5. The binomial distribution whose mean is 5 and variance is 10 is_____
6. The mean of binomial distribution is_____.
7. If the mean is 4 and variance is 2 of binomial distribution then p=_____
8. The value of p in a binomial distribution in terms of q is_____
9. p +q= _____ in a binomial distribution.
10. The mean of poisson distribution is_____.

UNIT III

1. 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

2. 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

3. 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
4. The hypothesis that an analyst is trying to prove is called the
   a. elective hypothesis b. alternative hypothesis
   c. optional hypothesis d. null hypothesis

5. 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. the null hypothesis is void

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. 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.

10. 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.

1. A hypothesis is true but rejected this is an error of type_____
2. A hypothesis is false but accepted this is an error of type_____
3. A die is thrown 256 times an even digit turns up 150 times then die is _____.
4. A single tail test is used when _____
5. Null hypothesis is defined as_____
6. Alternate hypothesis is defined as_____
7. 500 eggs are taken from a large consignment and 50 are found spoiled standard error of proportion is_____
8. Random sample of 400 products contains 52 defective items standard error of proportion is_____
9. A die is thrown 100 times an even digit turns up 10 times then die is _____.
10. Type II error in hypothesis testing is_____.

UNIT IV

1. Analytic function is
a) single valued function b) bounded function c) differential function d) all of these
2. The value of m so that $2x - x^2 + my^2$ may be harmonic is
a) 0 b)1 c)2 d)3
3. If $f(z) = \sin z$, then
a) $f(z)$ is continuous in every finite region b) $f(z)$ is not continuous in every finite region

c) $f(z)$ is not continuous at 1 *d*) None

4. The value of $\int_a^b z dz$=

a) b-a b) $b^2 - a^2$ c) $\frac{1}{2}b^2 - a^2$ d) None

5. The function $f(z) = xy + iy$ is

a) every where continues but not analytic b) discontinuous everywhere but not analytic

c) every where continuous and analytic d) neither continuous nor analytic

6. The value of m so that $2x - x^2 + my^2$ may be harmonic is

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

7. Let $f(z)=Z^2$, then f(1+3i) is

a) 8-6i b) -8+6i c) -8-6i d) 8+6i

8. The Cauchy-Riemann equations in polar form

a) $u_r=(1/r)\, v_\theta$, $v_r=-(1/r)\, u_\theta$ b) $u_\theta=(1/r)\, v_r$, $v_\theta=-(1/r)\, u_r$

c) 1, -1 d) None

9. The analytic function whose real part is $u=x^2 - y^2 - x$

a)z^2-z+c b)z^2+z+c c)$-z^2-z+c$ d) None

10. If f(z) is analytic within and on a closed curve C, and if a is any point within C, then $\int_c \frac{dz}{z-a}$

a) f(a) b) 2πi f(a) c) f(a) / 2π d) 2πf

11. The harmonic conjugate of $x^3 - 3xy^2$ is ----------

12. For what values of a, b, c, the function f(z)= (x + ay) + i(bx +cy) is analytic.

13. If f(z) = U + Iv then f^i(z) = ----------

14. Imaginary part of cos z ----------.

15. $e^x \cos y$ Harmonic conjugate is _____

16. Imaginary part of e^{2z} ----------

17. Cauchy Riemann equations in Cartesian form _____.

18. Every Analytic function with _____ is constant.

19. Cauchy- Riemann equations for a function to be analytic in polar form are _____

20.The function $f(z) = z^2$ is a function which is _____

UNIT V

1. Polynomial of degree n has a pole of order n at

A) zero B) infinity C) anywhere D) curve c

2. The residue of $f(z) = \frac{1}{(z+2)^2(z-2)^2}$ at $z = 2$ is _____.

a)-1/32 b)-1/16 c)1/16 d)1/32

3. If the mapping w = f(z) is conformal then the function f(z) is

A) analytic B) non analytic C)harmonic D)none

4. The fixed point of the transformation w = $\frac{6z-9}{z}$ are

A) z =3,3 B) z = -3,3 C) z =-3 , -3 D) z =3i

5. Cauchy's integral theorem is applicable only for a _____ region R enclosed

a simple curve C.

a)Simply connected b) Multiple connected c) Both A and B d) None

6. For $f(z) = \frac{\sin\sqrt{z}}{\sqrt{z}}$, z = 0 is

a) Simple pole b) Essential singularity c) Removable singularity d) None

7. A point at which f(z) fails to be analytic is called ……of f(z)

a)Singular point b) null point c) zero point d) none

8. If f(z) = z^2 then f(-2+i)=……

a) 3+4i (b) 3-4i (c) 4-3i (d) none

9. If f (z) value at a such that f(a)=0 . then a is called

a) Zero b) pole c) simple pole d) None

10. If $f(z) = \frac{z}{8-z^3}$ then residue of $f(z) at z = 2$ is

A)-1/8 B)1/8 C)-1/6 D)1/6

1.. If W = log z is analytic everywhere except at z =----------

2. For what values of a, b, c, the function f(z)= (x + ay) + i(bx +cy) is analytic.

3. An analytic function f(z) is such that $Re(f'(z)) = 2y \ \& \ f(1+i) = 2$ then the imaginary part of $f(z) is$ _____.

4 .The value of $\int_0^{4+2i} z dz$ is_____ .

5 .If c is the circle $|z-3i| = 4 \ then \oint \frac{dz}{z^2+9}$ = _____.

6. $\int \frac{cosz}{z^3}$ at |z| = 2 is_____.

7. $\int \frac{z^2-4}{z^2+4} dz$ evaluated anticlockwise around the circle$|z-i| = 2 \ is$ _____.

8. Given $f(z) = \frac{1}{z+1} - \frac{2}{z+3}$. If c is a counter clock wise path in the z-plane such that $|z+1| =$ then the value of $\frac{1}{2\pi i} \oint f(z) dz is$

9. The fixed points of f(z) = $\frac{2iz+5}{z-2i}$ are _____.

10. Find the radius of convergence of the series of the function $f(z) = \frac{1}{1-z}$ about $z = \frac{1}{4}$ is _____.

WEBSITES:

1. www.mathworld.wolfram.com
2. www.researchgate.net
3. www.ocw.mit.edu
4. http://nptel.ac.in/courses/111105041/
5. http://nptel.ac.in/courses/111105035/
6. http://nptel.ac.in/noc/individual_course.php?id=noc16-ma03

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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. Sample spaces and events.
2. Types of Distributions.
3. Test of Significance for Large and Small samples.
4. Complex variables and C-R eqns.
5. Mobius Transformations.

CASE STUDIES / SMALL PROJECTS:

1. To estimate the percentage of students.
2. To survey Medical and health research.
3. To conduct case study using F-test for sick and cured patients.