

A

Course File

On

Mathematics - III

(R16)

In the department of

Humanities and Sciences



CMR ENGINEERING COLLEGE

(Affiliated to J.N.T.U, HYDERABAD)

Kandlakoya(v),Medchal -501 401

COURSE FILE

Subject: **Mathematics - III**

Year: **I– B.Tech I Sem**

Branch: **C.S.E, E.C.E,MECH.**

SL.NO	CONTENTS
1	Department Vision & Mission
2	List of PEOs , POs & PSOs
3	List of Cos (Action verbs as per Bloom's Taxonomy)
4	Syllabus Copy and Suggested/Reference Books
5	Session Plan/Lesson Plan
6	Session Execution Log
7	Lecture Notes
8	Assignment Questions along with sample Assignments Scripts
9	Mid Exam Question Papers along with sample Answers Scripts
10	Scheme of Evaluation
11	Mapping of COs with POs and PSOs
12	Attainment of COs,POs and PSOs (Excel Sheet)
13	University Question Papers/ Question Bank
14	Power Point Presentations (PPTs)
15	Websites/URLs/ e- Resources

1. Institute Vision & Mission

Vision

To be recognized as a premier institution in offering value based and futuristic quality technical education to meet the technological needs of the society.

Mission

To impart value based quality technical education through innovative teaching and learning methods. To continuously produce employable technical graduates with advanced technical skills to meet the current and future technological needs of the society. To prepare the graduates for higher learning with emphasis on academic and Industrial research

PROGRAM OUTCOMES (PO's):

NBA Graduate Attributes

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

3.List of COs(Action verbs as per Bloom's Taxonomy)

Branch : CSE

Regulation: R16

Course Code.CO No	Course Outcomes (CO's)
At the end of the course student will be able to	
CO1	Differentiate and Study various random variables and distributions.
CO2	Calculate mean, proportions and variances of sampling distributions and to Estimate the confidence interval for population parameters.
CO3	Test the hypothesis for single and difference of means and proportions
CO4	Perform ANOVA test for several means.
CO5	Find the root of an equation , Solve the system of equations and to Fit a curve to the given tabulated data.
CO6	To Study Numerical Integration and to Find approximate solutions of first order ODE with initial conditions.

COURS E CO-PO MATRI X	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
CO 1	3	3	2	2	-	-	-	-	-	-	-	-
CO 2	3	3	2	2	-	-	-	-	-	-	-	-
CO 3	3	3	2	2	-	-	-	-	-	-	-	-
CO 4	3	3	2	2	-	-	-	-	-	-	-	-
CO 5	3	3	2	2	-	-	-	-	-	-	-	-
CO6	3	3	2	2	-	-	-	-	-	-	-	-

4.Syllabus Copy and Suggested/Reference Books:

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY **HYDERABAD**

I YEAR B.Tech I Sem

UNIT – I Random variables and Distributions:.

OBJECTIVE

1. Different types of Random variables discrete and continuous
2. To learn Moment generating function, Moments and properties
3. Applicability of Binomial & geometric distributions.
4. Normal distribution and its properties.

SYLLABUS

Introduction, Random variables, Discrete random variable, Continuous random variable, Probability distribution function, Probability density function, Expectation, Moment generating function, Moments and properties. Discrete distributions: Binomial and geometric distributions. Continuous distribution: Normal distributions

UNIT – II : Sampling Theory

OBJECTIVE

1. Construction of sampling distributions of means.
2. To learn Sampling distribution of variances
3. Definition of estimation theory.
4. Point and interval estimation.

SYLLABUS

Introduction, Population and samples, Sampling distribution of means (σ -known)-Central limit theorem, t-distribution, Sampling distribution of means (σ unknown) Sampling distribution of variances
 $-\chi^2$ and F- distributions, Point estimation, Maximum error of estimate, Interval estimation.

UNIT – III : Tests of Hypothesis :

OBJECTIVE

1. Understand the definitions used in Hypothesis testing.
2. State the null and alternate hypothesis.
3. Find critical values for the z-test.
4. State the steps used in Hypothesis testing.
5. Test means for large samples using the z test.
6. Test means for small samples using the t test.
7. Proportions and their differences.
8. ANOVA for one-way classified data.

SYLLABUS

Introduction, Hypothesis, Null and Alternative Hypothesis, Type I and Type II errors, Level of significance, One tail and two-tail tests, Tests concerning one mean and proportion, two means-proportions and their differences-ANOVA for one-way classified data.

UNIT – IV Algebraic and Transcendental Equations & Curve Fitting:

OBJECTIVE

1. Finding solution of algebraic and transcendental equations.
2. Solving linear system of equations by Gauss-Jacobi and Gauss-Seidal Methods.
3. To fit a curve by method of least squares.

SYLLABUS

Introduction, Bisection Method, Method of False position, Iteration methods: fixed point iteration and Newton Raphson methods. Solving linear system of equations by Gauss-Jacobi and Gauss-Seidal Methods.

Curve Fitting: Fitting a linear, second degree, exponential, power curve by method of least squares.

UNIT – V Numerical Integration and solution of Ordinary Differential equations:

OBJECTIVES

1. To understand the concept of numerical integration.
2. To find the solution of ordinary differential equations by different methods.

SYLLABUS

Trapezoidal rule , Simpson's 1/3rd and 3/8th rule- Solution of ordinary differential equations by Taylor's series, Picard's method of successive approximations, Euler's method, Runge-Kutta method (second and fourth order)

SUGGESTED BOOKS

Text Books:

1. Probability and Statistics for Engineers by Richard Arnold Johnson, Irwin Miller and John E. Freund, New Delhi, Prentice Hall.
2. Probability and Statistics for Engineers and Sciences by Jay L. Devore, Cengage Learning.
3. Numerical Methods for Scientific and Engineering Computation by M. K. Jain, S. R. K. Iyengar and R. K. Jain, New Age International Publishers

References:

1. Fundamentals of Mathematical Statistics by S. C. Gupta & V. K. Kapoor, S. Chand.
2. Introductory Methods of Numerical Analysis by S. S. Sastry, PHI Learning Pvt. Ltd.
3. Mathematics for engineers and scientists by Alan Jeffrey, 6th edition, CRC press

5. Session Plan/Lesson Plan:

UNIT	TOPICS/ SUB TOPICS	NO. OF PERIODS		SUGGESTED BOOKS	REMARKS
UNIT-1	Random variables and Distributions:				
	Random variables	L1	16	T1,T1,R1	
	Discrete & continues	L2,L3		T1,T2,R2	
	Probability distribution function, Probability density function,	L4,L5		T1,T2,R2	
	Expectation, Moment generating function	L6,L7		T1,T2,R2	
	Moments and properties.	L8,L9		T1,T2,R2	
	Binomial distribution	L10,L11		T1,T2,R2	
	geometric distribution	L12,L13		T1,T2,R2	
	Normal distribution	L14,15,L16		T1,T2,,R1,R2	
UNIT-II	Sampling Theory				
	Introduction, Population and samples	L17	12	T1,R1	
	Sampling distribution of means (σ Known)	L18,L19		T1,T2,R2	
	Sampling distribution of means(σ unknown)	L20,L21		T1,T2,R2	
	t-distribution	L22,L23		T1,T2,R2	
	Sampling distribution of variances $-\chi^2$ and F- distributions,	L24,L25.L26		T1,T2,R2	
	Point estimation, Maximum error of estimate, Interval estimation	L27,L28		T1,T2,R2	
UNIT-III	Tests of Hypothesis				
	Introduction, Hypothesis, Null and Alternative Hypothesis,	L29,L30	17	T1,R1,T2	
	Type I and Type II errors, Level of significance,	L31		T1,R1,T2	
	One tail and two-tail tests,	L32		T1,T2,R2	

	Tests concerning single mean (large and small) , paired t test	L33,L34,L35, L36		T1,T2,T3,R12	
	Tests concerning single proportion(large and small)	L37,L38		T1,R1,T2	
	Difference of means (large and small)	L39,L40		T1,R1,T2	
	Difference of proportions (large and small)	L41,L42		T1,R1,T2	
	ANOVA for one-way classified data.	L43,L44,L45		T1,R1,T2	
UNIT-IV	Algebraic and Transcendental Equations & Curve Fitting:				
	Bisection Method	L46,L47	14	T1,R1,T2	
	Method of False position	L48		T1,R1,T2	
	Iteration methods: fixed point iteration	L49		T1,T2,R2	
	Newton Raphson methods.	L50		T1,T2,R2	
	Gauss-Jacobi Methods.	L51,L52		T1,T2,R2	
	Gauss-Seidal Methods.	L53,L54		T1,R1,T2	
	Fitting a linear curve	L55,L56		T1,T2,R2	
	Fitting a second degree curve	L57		T1,T2,R2	
	Fitting an exponential curve	L58		T1,T2,R2	
	Fitting a power curve	L59		T1,T2,R2	
	Numerical Integration and solution of Ordinary Differential equations				
UNIT-V	Trapezoidal rule	L60	9	T1,T2,R2	
	Simpson's 1/3rd rule	L61		T1,T2,R2	

Simpson's 3/8th rule	L62	T1,T2,R2	
Taylor's series method	L63	T1,T2,T3,R1	
Picard's method of successive approximations	L64	T1,T2,R2	
Euler's method	L65,L66	T1,R1,T2	
Runge-Kutta method (second and fourth order)	L67,L68	T1,R1,T2	

6.Session Execution Log:

UNIT		TOPICS/ SUB TOPICS	Period of Completion
UNIT-1	Random variables and Distributions	Random variables	
		Discrete & continues	
		Probability distribution function, Probability density function,	
		Expectation, Moment generating function	
		Moments and properties.	
		Binomial distribution	
		geometric distribution	
		Normal distribution	
UNIT-II	Sampling Theory	Introduction, Population and samples	
		Sampling distribution of means (σ Known)	
		Sampling distribution of means(σ un known)	
		t-distribution	
		Sampling distribution of variances $-\chi^2$ and F-distributions,	

		Point estimation, Maximum error of estimate, Interval estimation
UNIT-III	Tests of Hypothesis	Introduction, Hypothesis, Null and Alternative Hypothesis,
		Type I and Type II errors, Level of significance,
		One tail and two-tail tests,
		Tests concerning single mean (large and small) , paired t test
		Tests concerning single proportion(large and small)
		Difference of means (large and small)
		Difference of proportions (large and small)
		ANOVA for one-way classified data.
UNIT-IV	Algebraic and Transcendental Equations & Curve Fitting:	Bisection Method
		Method of False position
		Iteration methods: fixed point iteration
		Newton Raphson methods.
		Gauss-Jacobi Methods.
		Gauss-Seidal Methods.
		Fitting a linear curve
		Fitting a second degree curve

		Fitting an exponential curve
		Fitting a power curve
		Trapezoidal rule
UNIT-V	Numerical Integration and solution of Ordinary Differential equations	Simpson's 1/3rd rule
		Simpson's 3/8th rule
		Taylor's series method
		Picard's method of successive approximations
		Euler's method
		Runge-Kutta method (second and fourth order)

7. Lecture Notes (Attached)

8. Assignment Questions along with sample Assignments Scripts:

MATHEMATICS – 3 MID I ASSIGNMENT QUESTIONS

1.A). If X is a continuous random variable has the probability density - **(CO 1)**

$$f(x) = \begin{cases} kx^2 e^{-x}, & x > 0 \\ 0, & x \leq 0 \end{cases} . \text{ then find the value of } k, \text{ mean and variance .}$$

b). Given that $f(x) = K/2x$, if $X = 1,2,3,4$ is a probability distribution of a random variable X Find K , mean and variance of x.

c). Calculate the first four moments of the following dist. about an arbitrary origin. Also find moments about mean.

Class Interval	60-62	63-65	66-68	69-71	72-74
Frequency	5	18	42	27	8

d) Derive the moment generating function. Also find MGF of X having the pdf, $f(x) = x, 0 \leq x < 1$
 $2 - x, 1 \leq x < 2$.

e). Explain, with suitable examples, discrete and continuous random variables.

2.a) Find the first 3 moments about origin from moment generating function of the binomial distribution. - **(CO 1)**

b) Find the moment generating function of the Normal distribution. Find the odd and even order moments of a normal distribution.

c) Two dice are thrown 5 times. Find the probability of getting a sum of 7 (i) Twice, (ii) at least once
 iii) $P(1 < X < 5)$.

d) The mean and variance of a binomial dist. are 4 and $4/3$ respectively. Find $P(X \geq 1), P(X > 5)$.

e). Fit a binomial distribution to the following data.

x	0	1	2	3	4	5
f	2	14	20	34	22	8

3.a) . If X is a normal variate with mean 30 and the standard deviation 5, find the probabilities that -
(CO 1)

(a) $26 \leq X \leq 40$ (b) $X \geq 45$.

b) In a normal distribution, 7% of the items are under 35 and 89% are under 63. Find the mean and the standard deviation of the distribution.

c). In a normal distribution 31% of the items are under 31% and 8% are over 64. Find the mean and standard deviation of the distribution.

d). If the height of 300 students are normally distributed with mean 172 centimeters and standard deviation 6 cm, how many students have heights greater than 184 centimeters; between 164 and 180 centimeters (inclusive) and equal to 172 centimeters?

e). Fit a normal distribution to the following data.

x	2	4	6	8	10
f	1	4	6	4	1

4). a) A population consists of the five numbers 3, 4, 7, 9, and 12. Consider all possible samples of size two, which can be drawn i). with replacement and ii). Without replacement from this population. Find:
-(CO 2)

the mean of the population

the standard deviation of the population

the mean of the sampling distribution of means

the standard error of means.

b) If 2 gallon can of paint covers on the average 800 sft. with standard deviation 80 sft., what is the probability that the mean area covered by the sample of 60 of these 2 gallon cans will be any where from 750 to 825 sft.?

c). A random sample of size $n=100$ is taken from a population with $\sigma=5.1$. Give that the sample mean is $\bar{X}=21.6$. Construct a 95% confidence interval for the population mean.

d). For an F- distribution find i). $F_{0.05}$ with $v_1=7$ and $v_2=15$. ii). $F_{0.01}$ with $v_1=24$ and $v_2=19$.

iii). $F_{0.95}$ with $v_1=19$ and $v_2=24$. iv). $F_{0.99}$ with $v_1=28$ and $v_2=12$

5). a) A random sample of size 400 has a mean 82 and a SD of 18. What can you say about the maximum error with 95% confidence. Find the confidence limits if $\bar{x} = 82$. **-(CO 4)**

b). Write about Type I and Type II errors.

c). Explain the procedure for testing of hypothesis.

MATHEMATICS – 3 MID II ASSIGNMENT QUESTIONS

1.a). Mean of population = 0.700, mean of the sample=0.742, standard deviation of the sample =0.040 sample size=10. Test the null hypothesis for population mean=0.700

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

c). In a city A 20% of a random sample of 900 school boys had a certain physical defect. In another city B 18.5% of a random sample of 1600 school boys had the same defect. Is the difference between the proportions significant?

2.a). Two horses A and B were tested according to the time (in seconds) to run a particular track with the following results.

Horse A	28	30	32	33	35	29	34
Horse B	29	30	30	24	27	29	-

Test whether the two horses have the same running capacity.

b) A random sample of size 32 is taken from a population whose variance is 8 with probability 99, find the maximum error.

c). Write the formula to find the maximum error for the proportions.

i) single ii) difference between the proportions
 3.a). Find the root of the equation $x \log x = 1.2$ using false position method.

b). Find the root of the equation $x^3 - x - 3 = 0$

4.(a) By the method of least squares find the straight line that best fits the following data

x	1	2	3	4	5
y	14	27	40	55	68

b) Fit a parabola to the following data using the method of least squares.

x	1	3	7	9	11	13
y	3.49	8.69	19.09	24.29	29.49	34.69

c). Fit a polynomial of second degree to the data points (2, 3.07), (4, 12.85), (6, 31.47), (8, 57.38) and (10, 91.29).

d). Fit the curve $y = ae^{bx}$ to the following data.

x	0	0.5	1.0	1.5	2.0	2.5
y	0.10	0.45	2.15	9.15	40.35	180.75

5.a). Use Taylor's series method to find the approximate value of y when $x=0.1$ given that $y(0)=1$, $y' = 3x + y^2$.

b). Find $y(0.1)$ & $y(0.2)$ using Euler's modified form given that $y' = x^2 - y$, $y(0)=1$.

9. Mid Exam Question Papers along with sample Answers Scripts:

I-Mid MATHEMATICS-III

Answer all the questions

PART – A

1a) Define random variable. (2M)(CO 1)

b). Define Type – I and Type – II errors.

2) If X is a continuous random variable has probability density function $f(x) = \begin{cases} kx^2 e^{-x} & ; x > 0 \\ 0 & \text{otherwise} \end{cases}$

0 otherwise

Find i)k,ii)mean iii)variance (3M) (CO1)

3a) In a normal distribution 7% of the items are under 35 and 89% are under 63. Find the mean and standard deviation of the distribution. (CO1)

b).Prove that area under Normal curve is unity.

(OR)

4a) A population consists of the five numbers 3, 4, 7, 9, and 12. Consider all possible samples of size two, which can be drawn i). with out replacement . Find: - (CO 2)

the mean of the population

the standard deviation of the population

the mean of the sampling distribution of means

the standard error of means.

b) a) A random sample of size 100 has a mean 21.6 and with population SD of 5.1 .find fudicial limits at 95% confindence.

II-Mid MATHEMATICS-III

Answer all the questions

PART – A

1. a).Using Newton –Raphson method find square root of 24 (1 M) (CO 4)

b).Derive normal equations of a parabola by method of least squares (1 M) (CO 4)

2.a). Fit the curve $y = ae^{bx}$ to the following data. (1.5M) (CO 5)

x	0	0.5	1.0	1.5	2.0	2.5
y	0.10	0.45	2.15	9.15	40.35	180.75

b). Find

$y(0.1)$ & $y(0.2)$ using Euler's method given that $y' = x^2 - y$, $y(0) = 1$. (1.5M) (CO 5)

PART B

3.a).Two horses A and B were tested according to the time (in seconds) to run a particular track with the following results. (2.5 M)(CO 4)

Horse A	28	30	32	33	35	29	34
Horse B	29	30	30	24	27	29	-

Test whether the two horses have the same running capacity.

b). Three samples of five, five and four motor car tyres are drawn respectively from three brands A , B and C manufactured by three machines. The life time of these tyres (in 1000 miles)is given below . Test whether the average life time of the three brands of tyres are equal or not . (2.5 M)(CO 3)

A	B	C
35	30	28
40	25	24
33	34	30
36	28	26
31	33	-

(OR)

4. a). Dividing the range into 10 equal parts , find the value of $\int_0^{\frac{\pi}{2}} \sin x dx$, using i) . Trapezoidal rule

ii). Simpson's $\frac{1}{3}$ rd rule. iii) Simpson's $\frac{3}{8}$ th rule (2.5 M)(CO 5)

b). Use R-K method to evaluate $y(0.1)$ and $y(0.2)$ given that $y' = x + y$, $y(0) = 1$. (2.5 M)(CO 5)

11. Mapping of COs with POs and PSOs:

Course Outcomes	Relationship of Course outcomes(CO) to Program Outcomes (PO)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2										
CO2	3	3	2	2										
CO3	3	3	2	2										
CO4	3	3	2	2										

CO5	3	3	2	2										
CO6	3	3	2	2										

NOTE: 3- HIGH, 2-MEDIUM, 1-LOW

12. Attainment of COs, POs and PSOs (Excel Sheet):

13. University Question Papers/ Question Bank:

R13

Code No: 113AN

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year I Semester Examinations, November - 2015

PROBABILITY AND STATISTICS

(Common to ME, CSE, IT, MCT, AME, MIE, MSNT)

Time: 3 Hours

Max. Marks: 75

Note: This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A.

Part B consists of 5 Units. Answer any one full question from each unit.

Each question carries 10 marks and may have a, b, c as sub-questions.

PART - A (25 Marks)

- 1.a) Explain, with suitable examples, discrete and continuous random variables. [2M]
- b) Find the first 3 moments about origin from Moment generating function of the Binomial distribution. [3M]
- c) Write the relation between correlation and regression coefficients. Is it possible to have two variables x and y with regression coefficient as 2.8 and -0.5? Explain. [2M]
- d) Is the function $f(x) = \begin{cases} \frac{1}{2} x e^{-y}, & 0 < x < 2, y > 0 \\ 0, & \text{Otherwise} \end{cases}$ can be considered as a joint density function of two random variables X and Y ? [3M]
- e) Write the standard error of (i) sample mean (ii) difference of two sample means. [2M]
- f) Mean of population = 0.700, mean of the sample = 0.742, standard deviation of the Sample = 0.040 sample size = 10. Test the null hypothesis for population mean = 0.700. [3M]
- g) Explain queue classification-Kendall's notation. [2M]
- h) Write:
- the relation between Expected number of customers in the queue and in the system.
 - waiting time of a customer in the queue and in the system
 - the formula for finding the probability that there are more than n customers in the system. [3M]
- i) Classify the random processes. [2M]
- j) Find the values of x, y, z in order for $\begin{bmatrix} 0 & x & 1/3 \\ 0 & 0 & y \\ 1/3 & 1/4 & z \end{bmatrix}$ to be transition matrix. [3M]

PART-B

(50 Marks)

- 2.a) Is $f(x) = \frac{1}{2}x^2e^{-x}$ when $x \geq 0$ can be regarded as a probability function for a continuous random variable? If, so find Mean and Variance of the random variable.
- b) Find the moment generating function of the Normal distribution. Show that all odd order moments of a normal distribution are zero. [5+5]

OR

- 3.a) In a sample of 1000 cases, the mean of a certain test is 14 and standard deviation is 2.5. Assuming the distribution to be normal, find:
 i) How many students score between 12 and 15?
 ii) How many score above 18?
 iii) How many score below 18?
- b) Find the Moment generating function of Poisson distribution and find the first 3 moments. [5+5]

- 4.a) If X and Y are two random variables having joint density function

$$f(x, y) = \begin{cases} \frac{1}{8}(6-x-y), & 0 \leq x \leq 2, 2 \leq y < 4 \\ 0, & \text{otherwise} \end{cases}$$

Find: i) $P(X < 1/Y < 3)$ ii) $f_x(x)$ & $f_y(y)$.

- b) Find the coefficient of correlation between X and Y for the following data. [5+5]

X	1	2	3	4	5	6	7	8	9
Y	10	11	12	14	13	15	16	17	18

OR

- 5.a) Joint distribution of X and Y is given by $f(x, y) = 4xy e^{-(x^2+y^2)}$; $x \geq 0, y \geq 0$. Test whether X and Y are independent. Also find conditional density of X given Y=y.
- b) For the following data, find equations of the two regression lines. [5+5]

X	1	2	3	4	5
Y	15	25	35	45	55

- 6.a) Fit a binomial distribution to the following data and test the good ness of fit.

x	0	1	2	3	4
f	38	144	342	287	164

- b) A researcher wants to know the intelligence of students in a school. He selected two groups of students. In the first group there 150 students having mean IQ of 75 with a S.D of 15 in the second group there are 250 students having mean IQ of 70 with S.D of 20. Is there a significant difference between the means of two groups? [5+5]

OR

Code No: 53014

R09

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year I Semester Examinations, November - 2015

PROBABILITY AND STATISTICS

(Common to ME, CSE, AME, MIE, MSNT)

Time: 3 hours

Max. Marks: 75

Answer any five questions
All questions carry equal marks

- 1.a) A box I contains 3 red balls, 2 black and 1 white balls. Box II contains 1 red, 1 black and 3 white balls. Box III contains 3 red, 3 black and 3 white balls. A box is chosen at random and a ball is drawn what is the probability that it is from
- i) Box I ii) Box II iii) Box III.
- b) A random sample with replacement of size 2 taken from $S = \{1, 2, 3\}$. Let the random variable X denote the sum of the two numbers:
- i) Write the probability distribution of X
ii) The mean
iii) The variance. [8+7]
- 2.a) Ten coins are thrown simultaneously. Find the probability of getting:
- i) At least 1 head
ii) At least seven heads
iii) Only 2 times.
- b) A sample of 121 students is found to have a mean weight of 68 kgs. Can this be regarded as a sample from a population with mean weight 75 kgs. and standard deviation 31 kgs. [8+7]
- 3.a) A Random sample of 300 items is taken from a population whose standard deviation is 18. The mean of the sample is 82. Construct 95% confidence interval for the mean.
- b) A random sample of size 225 is taken whose mean is 80. Can this be regarded as a sample from population with mean 82 and standard deviation 15. [8+7]
- 4.a) Among 900 people in a state 90 are found to be chapati eaters. Construct 99% confidence interval for the proportion.
- b) In a sample of 1000 students 500 use ball pen and in another sample of 3500 students 1400 use ball pens. Test the significance between the difference of two proportions at 5% level. [7+8]
5. Given below is the number of male births in 1000 families with 5 children each. Is this result with the hypothesis that male births are equally probable? [15]

No. of boys	0	1	2	3	4	5
No. of families	40	300	250	200	30	180

6. Calculate the coefficient of correlation and the two lines of regression between the two variables x and y . [15]

x	10	12	18	24	23	27
y	13	18	12	25	30	10

7. The milk plant at a city distributes its products by trucks, loaded at the loading dock. It was its own fleet of trucks plus trucks of a private transport company. The trucks arrive at the interval of 20 minutes. The service time is 4 minutes.
- Average number of trucks in the queue
 - The probability that there are more than or equal to 4 trucks in the queue
 - The waiting time of a truck in the queue.
 - The variance of queue length. [15]

8. A Professor has three pet questions, one of which occurs on every test he gives. He never uses the same question twice in successive examinations. If he uses the question no 1, he tosses a coin and uses the question no. 2. If he uses the question no. 2, he tosses two coins and use the question no 3, if both are heads. If he uses the question no 3, he tosses three coins and use the question no 1, if all are heads. In long run which question does he use most often and with how much frequency is it used. [15]

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Code No: 09A30302

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD

B.Tech II Year I Semester Examinations, November/December-2013

Probability and Statistics

(Common to ME, CSE, MCT, AME, MIE, MIM, MSNT)

Time: 3 hours

Max. Marks: 75

Answer any five questions
All questions carry equal marks

- 1.a) If the probability density of a random variable X is given by
- $$f(x) = \begin{cases} k(1-x^2), & 0 < x < 1 \\ 0, & \text{Otherwise} \end{cases}$$
- Find (i) k and (ii) The cumulative distribution function of X .
- b) 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
- The probability that the research is promoted.
 - If research is promoted, what is the probability that V.C is politician? [15]
- 2.a) Out of 800 families with 5 children each, How many would you expect to have a
- 3 boys
 - at least one boy
 - either 2 or 2 boys.
- b) Suppose the weights of 800 male students are normally distributed with mean 28.8 kg and standard deviation of 2.06 kg. Find the number of students whose weights are
- between 28.4 kg and 30.4 kg
 - more than 31.3 kg. [15]
- 3.a) 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?
- b) A random sample of 500 items has mean 20 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. [15]
- 4.a) In a referendum submitted to the student's body at a university 850 men and 566 women voted. 530 of the men and 304 of the women voted in favor of a matter. Does this indicate a significant difference of the opinion on the matter at least 1% level, between men and women students?
- b) If the mean of a normal population is 6.48 and S.D is 1.5. How large a sample must be so that there will be 2% that the mean of the sample is less than 6.75? [15]
- 5.a) 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.
- b) 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? [15]

6. Calculate the coefficient of Correlation for the following data. [15]

X	9	8	7	6	5	4	3	2	1
Y	15	16	14	13	11	12	10	8	9

7. Consider a self-service store with one cashier. Assume Poisson arrival and exponential service times. Suppose 9 customers arrive on the average every 5 minutes and the cashier can serve 10 in 5 minutes. Find
- average number of customers queuing for service
 - probability of having more than 10 customers in the system
 - Probability that a customer has to queue for more than 2 minutes.
 - average waiting time of the customers
 - probability for n persons in the system.
- [15]

8. The transition probability matrix is given by

$$P = \begin{bmatrix} 0.1 & 0.4 & 0.5 \\ 0.2 & 0.2 & 0.6 \\ 0.7 & 0.2 & 0.1 \end{bmatrix} \text{ and } P_0 = [0.4, 0.4, 0.2]$$

- Find the distribution after three transitions.
 - Find the limiting probabilities.
- [15]

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14. Power Point Presentations (PPTs):

15. Websites/URLs/ e- Resources :

1. <http://mathforcollege.com/nm/nbm/gen/05inp/>
2. <http://www.mece.panam.edu/~jakypuros/Teaching/MECE2450/Notes/PolynomialInterpolation.pdf>
3. http://nm.mathforcollege.com/topics/fft_continuous.html
4. <http://users.ece.gatech.edu/~mcclella/2025/labs-s01/Lab11s01.pdf>
5. http://www.enm.bris.ac.uk/admin/courses/EMa2/PDEs/PDES_0203/EMa2_pdes_notes.pdf
6. <http://ar-new.mak.ac.ug/academics/courses/partial-differential-equations.html-0>
7. <http://maths.york.ac.uk/www/Vector1-0910>
8. <http://www.youtube.com/watch?v=NG9hkGQwT3k>
9. <http://www.youtube.com/watch?v=sDn5cc-8gHY>
10. <http://www.youtube.com/watch?v=ICNHXhLg2dl>
11. <http://www.youtube.com/watch?v=oYsb4rW2GUU>
12. <http://www.youtube.com/watch?v=U8riFeiu3s>
13. <http://www.youtube.com/watch?v=6ozQ9INV59s>
14. http://www.cengage.com/aushed/instructor.do?product_isbn=9780534370145
15. <http://na.uni-tuebingen.de/~lubich/pcam-ode.pdf>
16. http://www.youtube.com/watch?v=_oBgnTy85fM
17. <http://ocw.mit.edu/courses/mathematics/18-440-probability-and-random-variables-spring-2011/lecture-notes/>
18. <http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-041-probabilistic-systems-analysis-and-applied-probability-fall-2010/video-lectures/>
19. <http://freevideolectures.com/Course/2950/Introduction-to-Probability-and-Statistics-Fall-2011>
20. <http://www.scribd.com/doc/38271591/MIT-Lecture-Notes-on-Probability>
21. [wiki.stat.ucla.edu/socr/index.php/Probability and statistics_EBook](http://wiki.stat.ucla.edu/socr/index.php/Probability_and_statistics_EBook)
22. cran.r-project.org/web/packages/IPSUR/vignettes/IPSUR.pdf
23. www.mathwords.com/index_prob_stats.htm
24. www.math.utep.edu/Faculty/mleung/probabilityandstatistics/pslinks.html
25. <https://sites.google.com/a/iitd.ac.in/probability-statistics/>