Techno India NJR Institute of Technology

Course File

Advance Engineering Mathematics-II

(4CE2-01)

Session 2022-23

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SYLLABUS

II Year-IV Semester: B.Tech. (Civil Engineering)

4CE2-01: ADVANCE ENGINEERING MATHEMATICS-II

Credit: 2 | **Max. Marks: 100 (IA:20, ETE:80)**

2L+0T+0P | **End Term Exam: 2 Hours**

SN	CONTENTS	Hrs.
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Probability:** Basic concepts of probability, conditional probability, Baye's theorem.Random variable: Discrete and Continuous random variables, Joint distribution, Marginal distribution, Probability distribution function, Conditional distribution.Mathematical Expectations: Moments, Moment Generating Functions, variance and correlation coefficients, Chebyshev's Inequality, Skewness and Kurtosis. Binomial, Poisson and Normal distribution and their properties.	13
3	**Applied Statistics:** Basic concept of variance, Correlation and regression – Rank correlation. Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.	12
	Total	**26**

Course Overview:

Students should be able to understand the Probability and solve the Discrete and Random variables, conditional probability mean variance expectation and all type of distributions using in day to day life problems. Also understand test of significance on large sample data by various ways.

Course Out comes:

CO NO	COGNETIVE LEVEL	CO
4CE2-01.1	Analysis	Students understand to apply concepts of probability.
4CE2-01.2	Analysis	Students will be able touse discrete and continuous probability distributions, including requirements, mean and variance, and making decisions
4CE2-01.3	Analysis	Students are able to apply different probability distribution to identify and solve real life problem.
4CE2-01.4	Analysis	Students are able to analyzing the pair of variable are related or not, and predict the future value by using the regression equations.
4CE2-01.5	Analysis	Student use the statistical test to developing better management system and providing good services or results in their future life journey

Course Outcome Mapping with Program Outcome:

ADVANCE ENGINEERING MATHEMATICS-II														
Course Outcome	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO241.1	2	2	0	1	0	0	0	0	0	0	0	1	1	1	0
CO241.2	2	2	0	1	0	0	0	0	0	0	0	1	1	1	0
CO241.3	2	2	0	1	0	0	0	0	0	0	0	1	1	1	0
CO241.4	2	2	0	1	0	0	0	0	0	0	0	1	1	1	0
CO241.5	2	2	0	1	0	0	0	0	0	0	0	1	1	1	0
CO241 (AVG)	2	2	0	1	0	0	0	0	0	0	0	1	1	1	0

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

PRESCRIBED BOOKS

1. Advanced Engineering Mathematics, Jain and Iyengar ,Narosa Publications.
2. Higher Engineering Mathematics, B.V. Ramana, McGraw Hill Education.
3. Advanced Engineering Mathematics, Erwin Kreyszig, Wiley.
4. Advanced Engineering Mathematics, Gokharoo & Mehta, Unique book

Unit	Lecture No.	Topic
01	1.	Introduction
	2.	Probability & Conditional Probability
	3.	Numericals on probability
	4.	Baye’s theorem
	5.	Random variable
	6.	Discrete and continuous random variables
	7.	Joint distributaion and Marginal distribution
	8.	Probability distribution and Conditional distribution
	9.	Numericals
02	10.	Mathematical expectations
	11.	Moments, Moment generating functions
	12.	Numericals
	13.	Chebyshev’s Inequality
	14.	Skewness and Kurtosis
03	15.	Binomial Distribution
	16.	Numericals
	17.	Poisson probabilty distybution
	18.	Numericals
	19.	Normal Probability distribution
	20.	Numericals
04	21.	Variance
	22.	correlation coefficients
	23.	Regression
	24.	Rank correlation
	25.	Numerical
	26.	Curve fitting by the least square
	27.	Fitting by the straight lines
	28.	Second degree parabolas and more curves
	29.	Numerical
05	30.	Introduction test of significance
	31.	Large sample test for single proportion
	32.	Numerical
	33.	Difference of proportions
	34.	Numerical
	35.	Single mean
	36.	Numerical
	37.	Difference of means
	38.	Numerical
	39.	Difference of standard deviations
	40.	Numerical

Teaching and Learning resources unit-wise

Unit-1

https://youtu.be/b5VUnapu-qshttps://youtu.be/flUk8zwqGV0

Unit-2

https://youtu.be/FL6thjKSR58?list=PLNKx0RorxX44HBsItvZP5CzFX1qCQOwp5https://youtu.be/JOfnCCNj4gQ?list=PLyqSpQzTE6M_fDgY78f5lAT5zR6xHAajo

Unit-3

https://www.youtube.com/watch?v=o77UV7YrWvwhttps://youtu.be/GNdxE5wWth0

Unit-4

https://youtu.be/GG9zaveXNek

https://www.youtube.com/watch?v=LNrd5VslI2U

Unit-5

https://youtu.be/5YspFqUYXa4

https://youtu.be/zADj0k0waFY

QUIZ QUESTIONS

(Unit-Wise)

1	Define discrete random variable and continuous random variable with example
2	Define joint and marginal distribution.
3	Write karl pearson β and γ coefficients.
4	Define Skewness and Kurtosis with example
5	Write the statement of principle of least squares
6	Define the test of significance for difference of two means of two large samples.
7	Write the standard form of Normal distribution.
8	Write the statement of principle of least squares
9	Define the test of significance for difference of two means of two large samples.
10	Write the mean and variance of Binomial distribution
11	Define discrete random variable and continuous random variable with example
12	Write the standard form of Normal distribution.
13	Write the statement of principle of least squares
14	Define the test of significance for difference of two means of two large samples.
15	State the Baye's Theorem..

4E1206

Roll No. ____________

Total No of Pages: 3

4E1206

B. Tech. IV-Sem. (Back) Exam., Oct.-Nov. - 2020
HSMC Agriculture Engineering
4AG2 - 01 Advanced Engineering Mathematics – II
AG, CE, MI

Time: 2 Hours **Maximum Marks: 65**
Min. Passing Marks: 23

Instructions to Candidates:

Attempt all five questions from Part A, four questions out of six questions from Part B and one questions out of three from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

(Answer should be given up to 25 words only) **[5×2=10]**

All questions are compulsory

Q.1 State the Bayes' Theorem.

Q.2 Define the Marginal and Conditional distribution.

Q.3 Define the Skewness and Kurtosis.

Q.4 State the angle between two lines of regression. Also Interpret the case $r = 0$, $r = \pm 1$.

Q.5 Write the test of significance of single mean.

Part – B

(Analytical/Problem solving questions) ***[4×10=40]***

Attempt any four questions

Q.1 Obtain the rank correlation for the following data –

x :	81	78	79	73	69	68	62	58
y :	10	12	18	18	18	20	20	24

Q.2 State and prove the Chebyshev's Inequality.

Q.3 There are three boxes containing respectively 1 white, 2 red and 3 black balls; 2 white, 3 red and 1 black balls; 3 white, 1 Red, and 2 black balls. A box is chosen at random and from it two balls are drawn at random, which are 1 red and 1 white. Find the probability that these come from -

(a) The first box

(b) The second box

(c) The third box

Q.4 Define the curve fitting by the Method of least squares. Also fit a straight line to the following data.

(x, y) : (0, 1) (1,1.8) (2, 3.3) (3, 4.5) (4, 6.3)

Q.5 Fit a Binomial distribution to the following set of observations –

Variety (x):	0	1	2	3	4	5
Frequency (f):	10	20	25	20	17	8

Q.6 A sample of 400 male students is found to have a mean height of 168.67 cm. Can it be reasonable regarded as a sample from large population with mean height 168.47 cm. and SD 3.25 cm.

http://www.rtuonline.com

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) [1×15=15]

Attempt any one questions

Q.1 Two random variable X and Y have the following Joint Probability density function.

$$f(x, y) = \begin{cases} 2 - x - y;\ 0 \le x \le 1,\ 0 \le y \le 1 \\ 0 \quad \text{otherwise} \end{cases}$$

Find-

(a) Marginal Probability density function of X and Y

(b) Conditional density function

(c) Var (X) and Var (Y)

(d) Covariance between X and Y

Q.2 (a) Prove Poisson distribution as a limiting case of Binomial distribution.

(b) In a Normal distribution 31% of the item are under 45 and 8% are over 64. Find the parameters of the distribution.

Q.3 (a) if X is a Random Variate, then Prove that

(i) $E(X^2) \ge [E(X)]^2$

(ii) $|E(X)| \le E|X|$

(b) Sample of size 10 and 12 taken from two normal population gave $S_1 = 12$ and $S_2 = 18$. Test the Hypothesis $\sigma_1 = \sigma_2$.

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4E1313

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4E1313

B. Tech. IV - Sem. (Main) Exam., - 2022

Civil Engineering

4CE2 – 01 Advance Engineering Mathematics - II

AG, CE, MI

Time: 3 Hours **Maximum Marks: 70**

Instructions to Candidates:

Attempt all ten questions from Part A. Five questions out of seven questions from Part B and three questions out of five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

(Answer should be given up to 25 words only) **[10×2=20]**

All questions are compulsory

Q.1 A card is drawn from a well – shuffled pack of playing cards. What is the probability that it is either a spade or an ace?

Q.2 When A and B are two mutually exclusive events such that P (A) = 1/2 and P (B) = 1/3, find $P(A \cup B)$ and $P(A \cap B)$.

Q.3 If X and Y are two random variables such that E (X) = 3 and E (Y) = 5, then what will be the value of E (2X + 4Y)?

Q.4 Write the Chebyshev's Inequality.

Q.5 If mean of Poisson distribution is 3, then what is the value of variance?

Q.6 What type of correlation exists when the values of two variables move in the same direction?

Q.7 If r = 0.8 and $b_{xy} = 0.32$, then what will be the value of b_{yx}?

Q.8 If y = 2x + 10 is the best fit for 10 pairs of values (x, y), by least square method and $\sum y = 200$; then find the value of $\sum x$.

Q.9 Which distribution is useful for large sample while testing for population means?

Q.10 What is the meaning of the testing of the hypothesis?

PART – B

(Analytical/Problem solving questions) **[5×4=20]**

Attempt any five questions (Word limit 100)

Q.1 In a bolt factory machines A, B and C manufactures respectively 25%, 35% and 40% of the total. Of their output 5, 4, 2 percentages are defective bolts. A bolt is drawn at random from the product and is found to be defective. What is the chance that it was manufactured by machine C?

Q.2 A continuous random variable has the probability density function $f(x) = kx^2e^{-x}$, $x \geq 0$. Find its second moment about mean.

Q.3 A prefect cubical die is thrown a large number of times in sets of 8. The occurrence of 5 and 6 is called a success. In which proportion of the sets you expect 3 successes.

Q.4 If $P(X = 2) = 9P(X = 4) + 90P(X = 6)$ in the Poisson distribution then find its mean, variance and standard deviation.

Q.5 Fit a second degree parabola to the following -

x	0	1	2	3	4
y	1	1.8	1.3	2.5	6.3

Q.6 Two random variables have the following regression lines: $3x + 2y - 26 = 0$ and $6x + y - 31 = 0$. Find the mean values and coefficient of correlation between x and y.

Q.7 A coin is tossed 400 times and it turns up head 216 times. Discuss whether the coin may be unbiased one.

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) **[3×10=30]**

Attempt any three questions

Q.1 Let X and Y be continuous random variables having joint density function -

$$f(x,y) = \begin{cases} c(x^2 + y^2), & 0 < x < 1, 0 < y < 1 \\ 0, & \text{otherwise} \end{cases}$$

Determine -

(a) constant c,

(b) $P\left(X < \frac{1}{2}, Y > \frac{1}{2}\right), P\left(\frac{1}{4} < X < \frac{3}{4}\right), P\left(Y < \frac{1}{2}\right)$

(c) marginal density functions of X and Y

(d) whether X and Y are independent

(e) conditional distribution of X and Y

Q.2 Determine the binomial distribution's moment generating function and, as a consequence, its mean and variance.

4E 4135

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4E 4135

B.Tech. IV Semester (Main/Back) Examination, May-2018
Electronics & Comm.
4EC6A Advanced Engg. Mathematics - II
AI, BM, EI, CRE, EC, PE, PC

Time : 3 Hours **Maximum Marks : 80**
Min. Passing Marks : 26

Attempt any ***five questions****, selecting* ***one question*** *from* ***each unit****. All questions carry* ***equal*** *marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.) Units of quantities used/calculated must be stated clearly.*

UNIT - I

1. a) Show that $u_1x+u_2x^2+u_3x^3+...=\frac{x}{1-x}u_1+\left(\frac{x}{1-x}\right)^2\Delta u_1+\left(\frac{x}{1-x}\right)^3\Delta^2 u_1+....$ **(8)**

b) Using Lagrange's interpolation formula, find the polynomial which passes through the points (0,2), (1,3), (2,12) and (5, 147) **(8)**

OR

1. a) Prove the following relations, where symbols have their usual meaning:

i) $E^{-1}=1-\frac{\delta^2}{2}+\delta\sqrt{1+\frac{\delta^2}{4}}$

ii) $\Delta\log f(x)=\log\left[1+\frac{\Delta f(x)}{f(x)}\right]$ **(8)**

b) Using Newton-Gregory forward interpolation formula, find the sum $S_n=1^3+2^3+3^3+......+n^3$ **(8)**

UNIT - II

2. a) Find the approximate value of $\int_0^{\pi/2}\sqrt{\cos\theta}\,d\theta$ by dividing the interval into nine ordinates. **(8)**

b) Using Milne's method, find y(3), if y(x) is the solution of $\frac{dy}{dx}=\frac{1}{2}(x+y)$ assuming y(0) = 2, y(0.5) = 2.636, y(1.0) = 3.595 and y(1.5) = 4.968. **(8)**

OR

2. a) From the following table of values of x and y, obtain $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ for $x=1.2$ **(8)**

x	y	x	y
1.0	2.7183	1.8	6.0496
1.2	3.3201	2.0	7.3891
1.4	4.0552	2.2	9.0250
1.6	4.9530		

b) Given the differential equation $\frac{dy}{dx}=\frac{x^2}{y^2+1}$, with the initial condition y = 0 when x = 0, use Picard's method to obtain y for x = 0.25, 0.5 and 1.0 correct to three places of decimals. **(8)**

UNIT - III

3. a) State and prove Rodrigue's formula for Legendre polynomial. **(8)**

b) Prove that :

i) $xJ_n'(x)=nJ_n(x)-xJ_{n+1}(x)$

ii) $J_n(x)=\frac{2(x/2)^{n-m}}{\Gamma(n-m)}\int_0^1(1-t^2)^{n-m-1}t^{m+1}J_m(xt)\,dt, n>m>-1$ **(8)**

OR

3. a) Show that : $\exp\left\{\frac{x}{2}\left(z-\frac{1}{z}\right)\right\}=\sum_{n=-\infty}^{\infty}z^nJ_n(x)$ **(8)**

b) Express $P(x)=x^4+2x^3+2x^2-x-3$ in terms of Legendre's polynomials. **(8)**

UNIT - IV

4. a) Suppose on an average 1 house in 1000 in a certain district has a fire during a year. If there are 2000 houses in that district, what is the probability that exactly 5 houses will have a fire during the year? **(4)**

b) A manufacturing firm produces steel pipes in three plants with daily production volume of 500, 1000 and 2000 units respectively. According to past experience it is known that the fractions of defective output produced by the three plants are respectively 0.005, 0.008 and 0.010. If a pipe is selected from a days total production and found to be defective. Find out what is the probability that it came from the first plant? **(6)**

c) Two random variables have the following regression lines : $3x+2y-26=0$ and $6x+y-31=0$. Find the mean values and coefficient of correlation between x and y. **(6)**

OR

4. a) A card is drawn from a well-shuffled pack of playing cards. What is the probability that it is either a spade or an ace? **(4)**

b) Find mean and variance of Binimial distribution. (6)

c) Calculate the coefficient of correlation between x and y using the following data :

X :	1	3	5	7	8	10
Y :	8	12	15	17	18	20

(6)

UNIT - V

5. a) Prove that the shortest distance between two given points in a plane is always a straight line. (8)

b) Find the extremals of the functional $v[y(x), z(x)] = \int_0^{\pi/2} [(y')^2 + (z')^2 + 2yz] dx$

where $y(0) = 0, y(\pi/2) = 1, z(0) = 0$ *and* $z(\pi/2) = -1$. (8)

OR

5. a) Derive Euler - Lagrange's equation. (8)

b) Find a function $y(x)$ *for which* $\int_0^1 [x^2 - (y')^2] dx$ is stationary, given that

$\int_0^1 y^2 dx = 2, y(0) = 0, y(1) = 0$. (8)

TUTORIAL SHEETS
TUTORIAL CHAPTER –I (CO242-01.1)

Advanced Engineering Mathematics (**4CE2-01)**
Year/ Sem: II/IV

A coin is tossed until a head appears, what is the expectation of the number of tosses required?

In a sample of 10 pens . If 10 % of the pens produced by a company are defective .Find out the probability that

(i) No pen must be defective
(ii) One must be defective
(iii) At least two must be defective

Q 3 Two card are drawn successively with replacement from a well shuffled pack of 52 cards, find the mean and the variance of number of aces.

TUTORIAL CHAPTER-II(**CO242-01.2**)

Advanced Engineering Mathematics (4CE2-01)
Year/Sem: II/IV

A factory produces razor blades, the probability of its being defective is 0.002 . the blades are supplied in packetsof 10. Using Poisson distribution , find number of packets containing no defective blades , one defective blade and Two defective blades respectively in a consignment of 10,000 packets .

(Given $e^{-0.02} = 0.9802$)

Let X be random variable with the following probability distribution, Find E(X), $E(X^2)$, E(2X+1))

X	-3	6	9
Y	1/6	1/2	1/3

Q.3 Solve $y^2 \log y = p^2 + xyp$

TUTORIAL CHAPTER –III(**CO242-01.3**)

Advanced Engineering Mathematics (4CE2-01)

Year/Sem: II/IV

Ques 1 On a telephone booth arrival of customers follows Poisson process with an average time of 10 minutes between one arrival and next arrival. The length of a phone call is assumed to be distributed exponentially with mean 3 minutes.

(i) Find the average number of persons waiting in the system.

(ii)What is the probability that he spent more than 10 minutes in the booth?

(iii)What is the probability that a person arriving at the booth will have to wait?

(iv)Find the fraction of the days when the phone will be used.

Ques 2 The distribution of weekly wages for 500 workers in a factory is approximately normal with mean and standard deviation of Rs. 75 and Rs. 15. Find the number of workers who receive weekly wages (i) more than Rs.90 (ii) less than Rs.45.[Given $P(0<z<1) = 0.1587$, $P(0<z<2) = 0.0228$, $P(0<z<3) =0.4987$]

Ques 3 If the height of 300 student are normally distributed with mean 64.5 inches and standard deviation 3.3 inches , how many students have height (i) less than 5 feet , (ii) between 5 feet and 5 feet 9 inches. Also find the height between which 99% of the student lie.

TUTORIAL
CHAPTER –IV(**CO242-01.4**)
Advanced Engineering Mathematics (4CE2-01)
Year/Sem: II/IV

Ques 1 Calculate the karl pearson coefficient of correlation between x and y. From the following data:

X :	17	18	19	19	20	20	21	21	22	23
Y :	12	16	14	11	15	19	22	16	15	20

Ques 2

Ten competitors in beauty contest got marks by three judges in the following orders

1^{st} judge	1	6	5	10	3	2	4	9	7	8
2^{nd} judge	6	4	9	8	1	2	3	10	5	7
3^{rd} judge	3	5	8	4	7	10	2	1	6	9

use the rank correlation coefficient to discuss which pair of judges have the nearest approach to common tastes in beauty.

Ques 3 Derive the equations of the lines of regression.

TUTORIAL CHAPTER –V (**CO242-01.5**)
Advanced Engineering Mathematics (4CE2-01)
Year/Sem: II/IV

A machine produces 16 defective articles in a batch of 500. After overhauling it produced 3 defective in a batch of 100. Has the machine improved?

A person throws 10 dice 500 times and obtains 2560 times 4,5 or 6. Can this be attributed to fluctuation of sampling?

In a hospital 480 female and 520 male babies were born in a week. Does this figure confirm the hypothesis that male and female is born in equal number?

ASSIGNMENT

B.Tech. IV Semester (Branch –CE)

Section - A

State Addition law of probability

If two event are independent and P(A)=1/3 ,P(B)=3/4 Find $P\left(\frac{A}{A \cup B}\right)$.

Define the random variable with suitable example.

The probability distribution of a random variable X is given by :-

X	0	1	2
P(X=x)	$3C^3$	$4C - 10C^2$	5C - 1

Find the value of C.

If the joint pdf of (X,Y) is given by:

$$f(x, y) \begin{cases} 2 & ,0 < x < 1 ,0 < y < x \\ 0 & ,otherwise \end{cases}$$

Find the marginal density function of X and Y.

Define Skewness and Kurtosis.

If X is the number of point rolled with a balanced die. Find the expected value of $G(X) = 2X^2 + 1$.

Section – B

A box contains 3 blue and 2 red marbles while another box contain 2 blue and 5 red marbles . A marble drawn at random from one of the boxes turns up to blue . Find the probability that it came from (i) first box (ii) second box.

A and B take turn in throwing of two dice, the first to throw 9 will be awarded a prize. If A has the firstturn , Show that their chances of winning are in the ratio 9:8 .

State and prove the Baye's Theorem.

The odds that a book will be reviewed favourably by three independent critics are 5 to 2 , 4 to 3 and 3 to 4 . What is the probability that of the three reviews, a majority will be favourable .

A random variable x has the following probability distribution

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

(i) Find k

(ii) Determine distribution function of x .

(iii) Find $P\left(\frac{1.5<x<4.5}{x>2}\right)$

Given the joint probability density $f(x,y) = \begin{cases} \frac{2}{3}(x + 2y) , & 0 < x < 1 , 0 < y < 1 \\ 0 & , elsewhere \end{cases}$. Find

(i) Marginal density of X and Y

(ii) Conditional density of X given Y = y and use it to evaluate $P\left\{\frac{X \le \frac{1}{2}}{Y = \frac{1}{2}}\right\}$

The first four moments of the distribution about the value 4 of the variable are -1.5, 17 , -30 and 108. Find the mean , variance , β_1 and β_2 . Comment upon the nature of distribution.

Thirteen cards are drawn simultaneously from a deck of 52. If aces count 1 , face cards 10 and others according to denomination. find the expectation of the total score on 13 cards.

Section – C

(a) For a frequency distribution the mean is 1.5, variance = 0.64, β_2=2.5 and $\gamma_1 = 0.3$ find μ_3 , μ_4 and first four moment about the origin.

(b) A random variable x assume the value r with th the probability, $(x = r) = q^{r-1}$, r=1,2,3………

Find the moment generating function and hence the mean and the variance.

Q.10(a) A random variable x has the probability density

$$f(x) = \begin{cases} 0\,, & x < 0 \\ Ke^{-2x} & x > 0 \end{cases}$$ Find

(i) K (ii) $(x > 5)$ (iii) $(1 < x < 3)$ (iv) The distribution function of F(x) .

(b)From a lot of 25 items, containing 5 defective , a sample of 4 items was drawn at random (i) without replacement (ii) with replacement. Find the expected value of the number of defective items in drawn sample.

Q.11For a certain binary communication channel, the probability that a transmitted '0' is recived as '0' is 0.95 and the probability that a transmitted '1' is received as '1' is 0.90 . If the probability that a '0' is transmitted is 0.4 , find the probability that

(i) a '1' is recived.

(ii) a '1' is transmitted given that a '1' is received .

Q.12 Two balls are selected at random from a box containing two red , three white and four blue balls . let (x,y) be a bivariable random where x and y denote the number of red and white ball chosen-

(i) Find the joint probability mass function of (x,y)

(ii) Find marginal probability mass function of x and y.

(iii) Conditional distribution of x given y=1 .

ASSIGNMENT-II(CO242-01.3)

Subject Code/ Name: 4CE2-01 /**AD ENGG. MATHEMATICS II** **Year/Sem: 2nd / IV**

Section - A

Define Binomial Probability Distribution.

Define Poisson Probability Distribution

Q3 Define Normal Probability Distribution.

Section – B

fit a Poisson distribution to the following data which gives the number of dodders in a sample of clover seeds:

No. of Dodders(x)	0	1	2	3	4	5	6	7	8
Observed Frequency	56	156	132	92	37	22	4	0	1

In a sample of 10 pens . If 10 % of the pens produced by a company are defective .Find out the probability that

(iv) No pen must be defective

(v) One must be defective

(vi) At least two must be defective.

Prove that Poisson distribution is the limiting case of Binomial distribution.

The distribution of weekly wages for 500 workers in a factory is approximately normal with mean and standard deviation of Rs. 75 and Rs. 15. Find the number of workers who receive weekly wages (i) more than Rs.90 (ii) less than Rs.45.

[Given $P(0<z<1) = 0..3413$, $P(0<z<2) = 0.4772$, $P(0<z<3) = 0.4987$]

If the height of 300 student are normally distributed with mean 64.5 inches and standard deviation 3.3 inches. How many students have height (i) less then 5 feet (ii) between 5 feet and 5 feet 9 inches . Also find the height between which 99% of student lie . [Given $P(0 < z < 1) = 0.3413$, $P(0 < z < 1.36) = 0.4131$, $P(0 < z < 2.33) = 0.49$, $P(0 < z < 2.57) = 0.495$].

A factory produces razor blades, the probability of its being defective is 0.002 . the blades are supplied in packets of 10. Using Poisson distribution , find number of packets containing no defective blades , one defective blade and Two defective blades respectively in a consignment of 10,000 packets . (Given $e^{-0.02} = 0.9802$)

Find mean and variance of Binomial distribution

Find the recurrence relation for the central moment of the binomial distribution. By the help of this find first three central moments.

Out of 800 families with 4 children each , how many families would be expected to have (i) 2 boys and 2 girls (ii) at least one boy (iii) no girls (iv) at most 2 girls . Assume equal probabilities for boys and girls .

If skulls are classified as A,B,C according as the length , breath index as under 75, between 75 and 80 , or over 80, find the mean and standard deviation of the classes in which A are 58% ,B are 38% and C are 4% . (Given Ø(0.20)=0.08 and Ø(1.75)=0.46 from the area table)

A car hire has two cars which it hires out day by day, The number of demands for a car on each day is distributed as Poisson variant with mean 1.5 . Calculate the proportion of days on which (i) neither car is used (II) Some demand is refused.

Find mean and variance of Normal distribution

ASSIGNMENT-III(CO242-01.4)

Subject Code/ Name: 4CE2-01 /**AD ENGG. MATHEMATICS II** **Year/Sem: 2nd / IV**

Section - A

Define Correlation with suitable examples.

Define (i) Curve fitting (ii) Principle of Least Squares.

Write the Equation of two lines of regression.

Write the normal equations of fitting of parabola.

Section - B

Calculate the karl pearson coefficient of correlation between x and y. From the following data:

X :	17	18	19	19	20	20	21	21	22	23
Y :	12	16	14	11	15	19	22	16	15	20

Calculate the correlation coefficient for the following height (in inches) of father(X) and their son (Y)

X:	65	66	67	67	68	69	70	72
Y:	67	68	65	68	72	72	69	71

Q.2 Ten competitors in beauty contest got marks by three judges in the following orders:

1st judge	1	6	5	10	3	2	4	9	7	8
2nd judge	6	4	9	8	1	2	3	10	5	7
3rd judge	3	5	8	4	7	10	2	1	6	9

Use the rank correlation coefficient to discuss which pair of judges have the nearest approach to common tastes in beauty.

Q. 3 Show that θ , the acute angle between the two lines of regression is given by

$$\tan\theta = \left(\frac{1-r^2}{r}\right)\left(\frac{\sigma_x\,\sigma_y}{\sigma_x^2+\sigma_y^2}\right)$$

. Interprets the case when r =0 , ± 1

Q. 4 In a partially destroyed laboratory record of analysis of correlation data , the following results are legible ; Variance of x = 9 , regression equation : 8x – 10y + 66 = 0 , 40x – 18y = 214 find :

(i) The mean value of x and y
(ii) The standard deviation of y and
(iii) Coefficient of correlation between x and y .

Q. 5 Fit a straight line to the following data:

X	1	2	3	4	6	8
Y	2.4	3.0	3.6	4.0	5.0	6.0

calculates the coefficient of correlation and obtain the line of regression for the following data.

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

Obtain also an estimate for y which should correspond on an average to x = 6.2

Fit a parabola of second degree to the following data

x	0	1	2	3	4
y	1	1.8	1.3	2.5	6.3

Find the two lines of regression and coefficient of correlation for the data given below.

$$n = 18 , \Sigma x = 12 , \Sigma y = 18 , \Sigma x^2 = 60, \Sigma y^2 = 96 , \Sigma xy = 48.$$

Find the most likely price in Bombay corresponding to the price of Rs.70 at Calcutta from the following:

	Calcutta	Bombay
Average price	65	67
Standard deviation	2.5	3.5

Prove that the correlation coefficient lies between -1 and 1.

Derive the equations of the lines of regression.

Lines 2x + 3y=10 and 4x + 5y=18 are lines of regression between two variables x and y . Decide which one is the lines of regression of x on y . Given x=5 , find y and also find mean values of variables.

ASSIGNMENT-IV(CO242-01.5)

Subject Code/ Name: 4CE2-01 / AD ENGG. MATHEMATICS II Year/Sem: 2^{nd} / IV

Section – A

Define statistical Inference.

Explain Hypothesis Testing and Estimation.

What is the meaning of significance level.

Define Null and Alternate Hypothesis.

Section – B

A coin is tossed 400 times and the head turned up 216 times. Test the hypothesis that the coin is unbiased.

A wholesaler in apples claims that only 4% of the apples supplied by him are defective. A random sample of 600 apples contained 36 defective apples. Test the claim of the wholesaler.

A machine produces 16 defective articles in a batch of 500. After overhauling it produced 3 defective in a batch of 100. Has the machine improved?

Two samples of 100 Electric bulbs each has a means 1500 and 1550, Standard deviation 50 and 60 . Can it be concluded that brands differ significantly at 1% level of significance in equality.

A sample of 100 tyres is taken from a lot. The mean life of tyres is found to be 39,350 kms. With a standard deviation of 3260. Could the sample from a population with mean life of 40,000 kms ? Established 99% confidence limit within which the mean life of tyres is expected to lie.

In a sample of 1000 the mean is 17.5 and the s.d. 2.5 . In another sample of 800 the mean is 18 and s.d. 2.7 . Assuming that the samples are independent, discuss whether the two samples can have come from a population which have the same s.d.

Q11 A Coin is tossed 900 times and head appeared 490 times. Would you conclude that the coin is biased one?

TECHNOINDIANJRINSTITUTEOFTECHNOLOGY
B. TECH II – YEAR (IV SEM.)
Civil Engineering
Advance Engineering Mathematics - II
Mid Term I

Max Marks: 70 **Time:2 Hrs**

Note:

1) The paper is divided into 2 parts: Part-A and, Part-B
2) Part-A contains 10 questions all compulsory and carries 2 mark each.
3) Part-B contains 5 questions. Each question is having two options choose one and carries 10 marks each.

PART – A

a)	Define joint and marginal distribution
b)	Write Karl Pearson β and γ coefficients.
c)	If the pdf of a random variable x be f(x) = 2x, 0<x<1, find the pdf of Y = 2X+1
d)	Explain Independent Random Variables
e)	Define probability density function
f)	When A and B are two mutually exclusive events such that P(A) =1/2 and P(B) = 1/3, find $(A \cup B)$ *and* $(A \cap B)$.
g)	If X and Y are two random variables such that E(X) = 3 and E(Y) = 5, then what will be the value of E(2X+Y)?
h)	A card is drawn from a well shuffled pack of playing cards, What is the probability that it is either a spade or an ace?
i)	Define skewness and kurtosis
j)	Define moment generating function.

PART – B

1.	State and prove the Baye's Theorem.
1.	In a bolt factory machines A, B and C manufacture respectively 25%, 35% and 40% of the total bolts. Of their output 5, 4 and 2 percent are respectively defective bolts. A bolt is drawn at random from the product and is found to be defective, what is probability that it was manufactured by machine A , B and C?

2.	Out of 800 families with 4 children each , how many families would be expected to have (i) 2 boys and 2 girls (ii) at least one boy (iii) no girls (iv) at most 2 girls . Assume equal probabilities for boys and girl
2.	There are 3 boxes containing respectively 1 white, 2 Red and 3 black balls, 2 White, 3 red, and 1black ball, 3 White 1 red and 2 black balls. A box is chosen at random and from it two balls are drawn at random. The two balls are one red and one white. Find the probability that these came from i) the first box ii) the second box iii) the third box

3. A random variable x has the following probability distribution

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

(i) Find k

	(ii) Determine distribution function of x . (iii) Find $P\left(\frac{1.5<x<4.5}{x>2}\right)$
3.	Given the joint probability density f(x,y) = $\begin{cases} \frac{1}{3}(x+y) \;, & 0<x<2\,, 0<y<1 \\ 0 \;, & elsewhere \end{cases}$. Find (i) Marginal density of X and Y (ii) Conditional density of X and Y iii) show that x and y are stochastically dependent

4.	From a lot of 25 items , containing 5 defective , a sample of 4 items was drawn at random (i) without replacement (ii) with replacement. Find the expected value of the number of defective items in drawn sample
4.	A fair coin is tossed three times. Find the mean and variance of number of heads.

5. Calculate the first four moments about mean for the following distribution and also find β_1 and β_2

X	0	1	2	3	4	5	6	7	8
Y	1	8	28	56	70	56	28	8	1

5. Find the skewness and kurtosis of the curve given by a distribution, having its first four moments about 4 as -1.5, 17, -30, and 108

TECHNOINDIANJRINSTITUTEOFTECHNOLOGY
B. TECH II – YEAR (IV SEM.)
Civil Engineering
Advance Engineering Mathematics - II
Mid Term II

Max Marks: 70 **Time:2 Hrs**

Note:

1) The paper is divided into 2 parts: Part-A and, Part-B
2) Part-A contains 10 questions all compulsory and carries 2 mark each.
3) Part-B contains 5 questions. Each question is having two options choose one and carries 10 marks each.

PART – A

A.	Write the standard form of Normal distribution.	CO3
B.	Write the mean and variance of binomial distribution	CO3
C.	Ten coins are tossed together. Find the probability of getting at least seven heads.	CO3
D.	Define Uniform distribution or rectangular distribution	CO3
E.	Write the Spearman's rank correlation formula.	CO4
F.	Write the statement of principle of least squares	CO4
G.	Explain the positive and negative correlation	CO4
H.	Write the regression coefficients	CO4
I.	Define the test of significance for difference of two means of two large samples.	CO5
J.	Explain the level of significance	CO5

Part- B (50 Marks)

1 A Find the mean and variance of the poission distribution	CO3
OR	
1(B) In a normal distribution 31% of the items are under 45 and 8% are over 64. Find the parameters (mean and variance) of the distribution.	CO3

2(A) Suppose that a manufactured product has two defects per unit of product inspected. Using Poission distribution, calculate the probabilities of finding a product without any defect, 3 defects, and 4 defects.	CO3
OR	
2(B)The income of a group of 10,000 persons was found to be normally distributed with mean Rs 1750 p.m. and S.D. of rs 50. Show that of this group 95% had income exceeding rs 1668 and only 5% had income exceeding Rs 1832. What was the lowest among the richest	CO3

3(A) Calculate the karl pearson coefficient of correlation between x and y. From the following data: CO4

X :	17	18	19	19	20	20	21	21	22	23
Y :	12	16	14	11	15	19	22	16	15	20

OR

3.(B) Calculate rank correlation coefficient for the following data CO4

X :	81	78	73	73	69	68	62	58
Y :	10	12	18	18	18	22	20	24

4 A 3(A) Fit a parabola of second degree to the following data — CO4

X	0	1	2	3	4
Y	1	1.8	1.3	2.5	6.3

OR

4(B) Find line of regression y on x of the following data, and also find the value of y at x = 6.2 — CO4

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

5(A) A sample of heights of 6400 Indians has a mean of 67.85 inches and a SD of 2.56 inches, while sample of heights of 1600 Austrian has a mean of 68.55 inches and a SD of 2.52 inches. Do the data indicate that Austrians are on the average taller than Indians? — CO5

OR

5(B) The SD of 64 students of a class in a test is 6.0. A new teacher then took over the class. After one year the same test gave the SD for the class as 5.0. Is there significant reduction in variability made by new teacher? Assume the marks in two tests have correlation = 0.6 — CO5

Model Question Paper with Key Solution

GEETANJALI INSTITUTE OF TECHNICAL STUDIES, UDAIPUR

RTU Model Paper

B. Tech. II Year, Semester IV

Sub: Advance Engineering Mathematics-II (Code: 4CE2-01)

Time: 2.00Hr **Max Marks: 80**

Q. No.	Question	Paper Marks	CO
	PART-A (Compulsory)		
1	Define joint and marginal distribution.	5*2	$CO_{242.1}$
2	Write Karl Pearson β and γ coefficients.		$CO_{243.2}$
3	Write the standard form of Normal distribution.		$CO_{241.3}$
4	Write the statement of principle of least squares		$CO_{241.4}$
5	Define the test of significance for difference of two means of two large samples.		$CO_{241.5}$
	PART-B (Attempt only 4 out of 6)		
1(a)	From a lot of 25 items , containing 5 defective , a sample of 4 items was drawn at random (i) without replacement (ii) with replacement. Find the expected value of the number of defective items in drawn sample	4*4	$CO_{241.1}$
(b)	State and prove the Baye's Theorem.		
2(a)	If the height of 300 student are normally distributed with mean 64.5 inches and standard deviation 3.3 inches. How many students have height (i) less then 5 feet (ii) between 5 feet and 5 feet 9 inches . Also find the height between which 99% of student lie . [Given P(0 < z < 1) = 0.3413 , P (0 < z < 1.36) =0.4131 , P(0 < z < 2.33) = 0.49 , P(0 < z < 2.57) = 0.495].		$CO_{241..2}$
(b)	Given the joint probability density f(x,y) = $\begin{cases} \frac{2}{3}(x+2y), & 0<x<1, 0<y<1 \\ 0, & elsewhere \end{cases}$. Find (i) Marginal density of X and Y (ii) conditional density of X given Y = y and use it to evaluate $P\left\{\frac{X\le\frac{1}{2}}{Y=\frac{1}{2}}\right\}$		
3(a)	Find mean and variance of Binomial distribution.		$CO_{241.3}$
(b)	If the height of 300 student are normally distributed with mean 64.5 inches and standard deviation 3.3 inches , how many students have height (i) less than 5 feet , (ii) between 5		
4(a)	Obtain regression line of x on y for the given data: X: 1 2 3 4 5 6 Y: 5.0 8.1 10.6 13.1 16.2 20.0		$CO_{241.4}$
b)	Fit a straight line to the following data : X: 1, 2, 3, 4, 6, 8 Y: 2.4, 3.0, 3.6, 4.0, 5.0, 6.0		
5(a)	Derive the equations of the lines of regression		$CO_{241.4}$

(b) find the mean and standard deviation of the normal distribution

$$f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{1}{2\sigma^2}(x-\mu)^2}, -\infty < x < \infty$$

.

CO241.3

6(a) A random sample of 400 flower stems has an average length of 10 cm. Can this be regarded as a sample from a large population with mean of 10.2cm and a SD of 2.25 cm.

CO241.5

(b) A sample of heights of 6400 Indians has a mean of 67.85 inches and a SD of 2.56 inches, while sample of heights of 1600 Austrian has a mean of 68.55 inches and a SD of 2.52 inches. Do the data indicate that Austrians are on the average taller than Indians?

PART-C (Attempt only 2 out of 3)

1(a) a random variable x has the following probability distribution — 2*7 — CO231.1

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

(iv) Find k

(v) Determine distribution function of x .

(vi) Find $P(\frac{1.5<x<4.5}{x>2})$

(b) Calculate the first four moments about mean for the following distribution and also find β_1 and β_2

CO231.2

X	0	1	2	3	4	5	6	7	8
Y	1	8	28	56	70	56	28	8	1

CO231.3

2(a) Ten competitors in beuty contest got marks by three judges in the following orders :

1st judge	1	6	5	10	3	2	4	9	7	8
2nd judge	6	4	9	8	1	2	3	10	5	7
3rd judge	3	5	8	4	7	10	2	1	6	9

CO231.3

Use the rank correlation coefficient to discuss which pair of judges have the nearest approach to common tastes in beauty.

(b) Find the constant ‘a ‘ so that vector v is a conservative field , where

In a partially destored laborateory record of analysis of correlation data , the following results are legible ;

Variance of x = 9 , regession equation : 8x – 10y + 66 = 0 , 40x – 18y = 214 find :

(iv) The mean value of x and y

(v) The standard deviation of y and

(vi) Coefficient of correlation between x and y

CO231.4

3(a)	obtain the rank correlation for the following data <table><tr><td>X</td><td>68</td><td>64</td><td>75</td><td>50</td><td>64</td><td>80</td><td>75</td><td>40</td><td>55</td><td>64</td></tr><tr><td>Y</td><td>62</td><td>58</td><td>68</td><td>45</td><td>81</td><td>60</td><td>68</td><td>48</td><td>50</td><td>74</td></tr></table>		**$CO_{231.5}$**
(b)	Two samples give the following results Sample I: sample size 100, AM 14.72 and SD 3.45 Sample II : sample size 125, Mean 18.65 and SD 4.72 have you reasons to believe that the two AMs are different?		