Code: 20A54202

R20

B.Tech I Year II Semester (R20) Regular Examinations November 2021

PROBABILITY & STATISTICS

(Common to CSE, IT, AI&ML, DS, IoF, AI and AI&DS)

Time: 3 hours

Max. Marks: 70

PART – A

(Compulsory Question)

*****

1 Answer the following: (10 X 02 = 20 Marks)

(a) Define kurtosis.

(b) If regression coefficient of Y on X is 0.5 and that of X on Y is 0.756 then find coefficient of correlation.

(c) A can hit a target once in 5 shots and B can hit two targets in three shots. What is the probability that 1 shot hit the target?

(d) A six face fair die is rolled a large number of times. Find the mean value of the outcome.

(e) If X has the binomial distribution with mean 6 and variance 2, then find the probability that $5<X<7$.

(f) Find the area between $z = -1$ and $z = 1$ in the standard normal curve.

(g) Define type-II error.

(h) In a random sample of 60 workers exposed to a certain amount of radiation. 8 experience some ill effects. Find 95% confidence interval for the true proportion.

(i) Define degrees of freedom.

(j) If two independent random samples of sizes 11 and 7 are taken from a normal population. The variance of the first sample will be at least four times as that of a second sample then find F.

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 Find mean, median, variance and coefficient of variation for the following data.

X	5	6	7	8	9	10	11	12	13
Y	4	7	9	12	13	15	21	32	38

OR

3 Given the bi-variate data:

X	62	63	64	64	65	66	68	70
Y	64	65	61	69	67	68	71	65

(i) Find the regression line of Y on X and hence predict Y if x = 67.

(ii) Find the regression line of X on Y and hence predict X if Y = 70.

UNIT – II

4 In a bolt factory machines A, B and C manufacture 20%, 30% and 50% of the total of their output and 6%, 3% and 2% are defective. A bolt is drawn at random and found to be defective. Find the probability that it is manufactured from: (i) Machine A. (ii) Machine B. (iii) Machine C.

OR

5 A continuous random variable has the probability density function

$$f(x) = \begin{cases} kxe^{-2x}, & for\ x \geq 0,\ k > 0 \\ 0, & otherwise \end{cases}$$

Determine: (i) k. (ii) Mean. (iii) Variance of the distribution. (iv) Distribution function.

Contd. in page 2

UNIT – III

6 If a Poisson distribution is such that $6p(x = 4) = p(x = 2) + 2\,p(x = 0)$, then find:
(i) Mean of x.
(ii) $p(x \leq 2)$.
(iii) $p(x>2)$.

OR

7 The marks obtained in mathematics by 1000 students are normally distributed with mean 78% and standard deviation 11%. Determine: (i) How many students got marks above 90%. (ii) What was the highest mark obtained by the lowest 10% of the students? (iii) With in what limit did the middle of 90% of the students lie.

UNIT – IV

8 (a) A researcher wants to know the intelligence of students in a school. He selected two groups of students. In the first group there are 150 students having mean IQ of 75 with a standard deviation of 15, in the second group there are 250 students having mean IQ of 70 with standards deviation of 20. Test whether there is any significant difference.

(b) In a big city 325 out of 600 men were found to be smokers. Does this information support the conclusion that the majority of men in this city are smokers?

OR

9 (a) A manufacturing firm claims that its brand A line outsells its brand B by 8%. If it is found that 42 out of a sample of 200 like brand A and 18 out of another sample of 100 like brand B. Test whether the 8% difference is valid claim.

(b) The mean life of a sample of 100 electric bulbs produced by a company is found to be 1570 hours with a standard deviation of 120 hours. If mean life time of all the bulbs produced by the company test the hypothesis for mean 1600 at 5% level of significance.

UNIT – V

10 (a) The mean life of a sample of 25 bulbs produced by a company is computed to be 157 hours with a standard deviation of 120 hours. The company claims that the average life of the bulbs produced by the company is 1600 hours using the level of significance 0.05. Is the claim acceptable?

(b) A sample analysis of examination results of 500 students was made. It was found that 220 students had failed, 170 had secured a third class, 90 were placed in second class and 20 got a first class. Do these figures commensurate with the general examination result which is in the ratio of 4:3:2:1 for the various categories respectively.

OR

11 (a) The following table gives the classification of 100 workers according to sex and nature of work. Test whether the nature of work is independent of the sex of the worker.

	Stable	unstable
Males	40	20
females	10	30

(b) A group of 5 patients treated with medicine. A weight 42, 39, 48, 60 and 41 kgs. Second group of 7 patients from the same hospital treated with medicine B weigh 38, 42, 56, 64, 68, 69 and 62 kgs. Do you agree with the claim that medicine B increases weight significantly?

*****

Code: 20A54301

R20

B.Tech II Year I Semester (R20) Regular Examinations April 2022

PROBABILITY & STATISTICS FOR CIVIL ENGINEERING

(Civil Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

*****

1 Answer the following: (10 X 02 = 20 Marks)

(a) Calculate the median for the following frequency distribution. 2M

Class interval	0-8	8-16	16-24	24-32	32-40	40-48
Frequency	8	10	16	24	15	7

(b) Find the mean and standard deviation of a set of observations 6, 8, 7, 5, 4, 9, 3. 2M

(c) If A and B are events with $P(A \cup B) = \frac{3}{4}$, $P(A \cap B) = \frac{1}{4}$ and $P(\overline{A}) = 2/3$ find P(A) and P(B). 2M

(d) If A and B are events with $P(A) = 3/8, P(B) = 5/8$ and $P(A \cup B) = 3/4$ *find* $P(A/B)$ *and* $P(B/A)$. 2M

(e) A random variable X has the following probability function: 2M

X = x	1	2	3	4	5	6
P(x)	K	3k	5k	7k	9k	11k

Then determine k.

(f) Find the binomial probability distribution which has mean 2 and variance 4/3. 2M

(g) Define: (i) Null hypothesis. (ii) Alternative hypothesis. 2M

(h) Write the test statistic to test for single proportion and difference of proportion in case of large sample tests. 2M

(i) Define 2 X 2 Contingency table. 2M

(j) Write the normal equation in fitting an exponential curve. 2M

PART – B

(Answer all the questions: 05 X 10 = 50 Marks)

2 Calculate the regression coefficient and obtain the lines of regression for the following data. 10M

x	1	2	3	4	5	6	7
y	9	8	10	12	11	13	14

OR

3 The regression equations calculated from a given set of observations for two random variables are $x = -0.4y + 6.4$ *and* $y = -0.6x + 4.6$. Calculate $\overline{x}, \overline{y}$ *and* r. 10M

4 In a college where boys and girls are equal in proportion, it was found that 10 out of 100 boys and 25 out of 100 girls were using the same brand of a two wheeler. If a student using that was selected at random what is the probability of being boy? 10M

OR

5 The probability distribution of a finite random variable X is given by the following table. 10M

x	-2	-1	0	1	2	3
P(x)	0.1	K	0.2	2k	0.3	k

Find the value of k, mean and variance

Contd. in page 2

6 In a consignment of electric lamps 5% are defective. If a random sample of 8 lamps are inspected what is the probability that one or more lamps are defective? 10M

OR

7 If the probability of a bad reaction from a certain injection is 0.001, determine the chance that out of 2000 individuals, more than two will get a bad reaction. 10M

8 A coin tossed 400 times and the head turned up 216 times. Test the hypothesis that the coin is unbiased at 5% level of significance. 10M

OR

9 In a city A 20% of a random sample of 900 school boys had a certain slight physical defect. In another city B, 18.5% of a random sample of 1600 school boys had the same defect. Is the difference between the proportions significant? 10M

10 A machinist is making engine parts with axle diameter of 0.7 inch. A random sample of 10 parts shows mean diameter 0.742 inch with a standard deviation of 0.04 inch. On the basis of this sample, would you say that the work is inferior? 10M

OR

11 Fit a parabola of second degree $y = a + bx + cx^2$ for the data. 10M

x	0	1	2	3	4
y	1	1.8	1.3	2.5	2.3

*****

Code: 20A54202

R20

B.Tech I Year II Semester (R20) Regular & Supplementary Examinations September 2022

PROBABILITY & STATISTICS

(Common to CS, CSE, CS&D, IT, CSE (AI&ML), CSE (DS), CSE (IoT), CSE (AI), AI&DS and AI&ML)

Time: 3 hours

Max. Marks: 70

PART – A
(Compulsory Question)

*****

1 Answer the following: (10 X 02 = 20 Marks)

(a) What is dispersion and what are the measures of dispersion? 2M

(b) What is Kurtosis and what is the Kurtosis of a normal curve? 2M

(c) If A and B are independent events then what can you say about independency of A^c and B^c? 2M

(d) Let X be a random variable with the following probability distribution, 2M

X	3	6	9
$P(X=x)$	$\frac{1}{6}$	$\frac{1}{2}$	$\frac{1}{3}$

Find $E(X)$ and $E(X^2)$.

(e) Whether Poisson distribution is of discrete or continuous type? Justify your answer. 2M

(f) A personal computer has the length of time between charges of the battery is normally distributed with a mean of 66 hours and a standard deviation of 20 hours. What is the probability when the length of time will be between 58 and 75 hours? 2M

(g) Define point estimation with example. 2M

(h) What is null hypothesis and alternative hypothesis? 2M

(i) Write the test statistic to test the independence of attributes. 2M

(j) What do you mean by goodness of fit? 2M

PART – B
(Answer all the questions: 05 X 10 = 50 Marks)

2 (a) Compute the regression line of y on x from the following data: 5M
(1, 2), (2, 2), (3, 2), (4, 2), (5, 2), (5, 1)

(b) Obtain the normal equations for fitting a curve of the form $y = ax + b/x$ for n points $(x_i, y_i), i = 1,2,\ldots,n$. 5M

OR

3 (a) Define correlation coefficient and find the correlation coefficient from the following data: 5M
(1, 2), (2, 5), (3, 3), (4, 8), (5, 7)

(b) Calculate the Karl Pearson coefficient of the following data: 5M
(4, 2), (6, 3), (8, 4), (10, 6), (11, 12)

4 (a) State and prove Baye's theorem 5M

(b) A box contains 10 screws, three of which are defective. Two screws are drawn at random. Find the probability that none of the two screws are defective. 5M

OR

5 (a) Two boxes contain ten chips each, numbered from 1 to 10 and one chip is drawn from each box. Find the probability of the event E that the sum of the numbers on the drawn chips is greater than 4. 5M

(b) State and prove probability theorem on addition. 5M

Contd. in page 2

R20

Code: 20A54202

6 (a) Let X has density function $f(x)=0.75(1-x^2)$, if $-1\le x\le 1$ and zero, otherwise. Find the distribution function and also find the probability $P\left(\frac{-1}{2}\le X\le\frac{1}{2}\right)$ 5M

(b) Find mean and variance of binomial distribution. 5M

OR

7 (a) Let X have the density function $f(x)=1-x^2$, if $-1\le x\le 1$ and zero, otherwise. Find the distribution function and also find the probabilities $P\left(\frac{1}{4}\le X\le 2\right)$. 5M

(b) Let $f(x)=\begin{cases}kx^2, & 0\le x\le 2\\ 0, & \text{otherwise}\end{cases}$. Find k and also find c_1 and c_2 such that $P(X\le c_1)=0.1$ and $P(X\le c_2)=0.9$. 5M

(a) Determine a 95% confidence interval for the mean of a normal distribution with variance $\sigma^2=9$, using a sample of $n=100$ value with $\bar{x}=5$. [For $Y=0.95, c=1.960$] 5M

(b) Among 100 fish caught in a large lake, 18 were inedible due to the pollution of the environment with what confidence can we assert that the error of this estimate is at most 0.065? 5M

OR

(a) Five independent measurements of the flash point of diesel oil $(D-2)$ gave the values (in °F) 144, 147, 146, 142, 144. Assuming normality, determine a 99% confidence interval for the mean. [For $F(c)=0.995, c=4.60$] 5M

(b) Suppose that we observe a random variable having the binomial distribution and get x successes in n trials. Then show that $\frac{x+1}{n+2}$ is not an unbiased estimator of θ if $E(\bar{\theta})=\theta$. 5M

(a) 200 digits we chosen at random from a set of tables. The frequencies of the digits were: 5M

Digits	0	1	2	3	4	5	6	7	8	9
Frequency	18	19	23	21	16	25	22	20	21	15

Use χ^2 test to assess the correctness of hypothesis that the digits were distributed in equal numbers in the table. Given that the values of χ^2 are respectively 16.9, 18.3 and 19.7 for 9, 10 and 11-degrees of freedom at 5% level of significance.

(b) In 250 digits from the lottery numbers, the frequencies of the digits 0, 1, 2, .., 9 were 23, 25, 20, 23, 23, 22, 29, 25, 33 and 27. Test the hypothesis that they were randomly drawn. 5M

OR

a) A random sample of 10 boys has the following IQ's: 5M

70, 120, 110, 101, 88, 83, 95, 98, 107, 100.

Do these data support the assumption of a population mean IQ of 100? Find a reasonable range in which most of the mean IQ values of samples of 10 boys lie.

b) The heights of 10 males of a given locality are found to be 70, 67, 62, 68, 61, 68, 70, 64, 64, 66 inches. Is it reasonable to believe that the average height is greater than 64 inches? Test at 5% significance level, assuming that for 9 degrees of freedom $P(t>1.83)=0.05$. 5M

*****

Scanned with CamScanner

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (ECE)– II Sem

L	T	P	C
3	0	0	3

(20A54201) DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

(Common to Civil, EEE, Mechanical, ECE and Food Technology)

Course Objectives:

- To enlighten the learners in the concept of differential equations and multivariable calculus.
- To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real world applications.

UNIT -1

Linear differential equations of higher order (Constant Coefficients)

Definitions, homogenous and non-homogenous, complimentaryfunction, generalsolution, particular integral,Wronskean, method of variation of parameters.Simultaneous linear equations, Applications to L-C-R Circuit problems and Mass spring system.

Learning Outcomes:

At the end of this unit, the student will be able to

- Identify the essential characteristics of linear differential equations with constant coefficients (L3)
- Solve the linear differential equations with constant coefficients by appropriate method (L3)
- Classify and interpret the solutions of linear differential equations (L3)
- Formulate and solve the higher order differential equation by analyzing physical situations (L3)

UNIT 2:

Partial Differential Equations

Introduction and formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, solutions of first order equations using Lagrange's method.

Learning Outcomes:

At the end of this unit, the student will be able to

- Apply a range of techniques to find solutions of standard pdes (L3)
- Outline the basic properties of standard PDEs (L2)

UNIT -3

Applications of Partial Differential Equations

Classification of PDE, method of separation of variables for second order equations. Applications of Partial Differential Equations: One dimensional Wave equation, One dimensional Heat equation.

Learning Outcomes:

At the end of this unit, the student will be able to

- Calcify the PDE (L3)
- Learn the applications of PDEs (L2)

UNIT-4

Vector differentiation

Scalar and vector point functions, vector operator del, del applies to scalar point functions-Gradient, del applied to vector point functions-Divergence and Curl, vector identities.

Learning Outcomes:

At the end of this unit, the student will be able to

- Apply del to Scalar and vector point functions (L3)
- Illustrate the physical interpretation of Gradient, Divergence and Curl (L3)

UNIT -5

Vector integration

Line integral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof) and applications of these theorems.

Learning Outcomes:

At the end of this unit, the student will be able to

- Find the work done in moving a particle along the path over a force field (L4)
- Evaluate the rates of fluid flow along and across curves (L4)
- Apply Green's, Stokes and Divergence theorem in evaluation of double and triple integrals (L3)

Text Books:

6 (a) Assume that 50% of all engineering students are good in mathematics. Determine the probabilities that among 18 students: (i) Exactly 10. (ii) At least 10 are good in maths. 5M

(b) In a normal distribution 7% of items are under 35 and 89% are under 63. Determine the mean and variance of the distribution. 5M

OR

7 (a) Find mean and variance of Poission distribution. 5M

(b) Let $f(x)=\begin{cases} kx^2, 0 \le x \le 2 \\ 0, \text{ otherwise} \end{cases}$. 5M

Find k and also find c_1 and c_2 such that $P(X \le c_1)=0.1$ and $P(X \le c_2)=0.9$.

8 (a) Write a short note on: (i) Sampling distribution. (ii) Estimation. 5M

(b) Explain working rule for testing of hypothesis. 5M

OR

9 (a) A dice is thrown 9,000 times and a throw of 3 or 4 is observed 3,240 times. Show that the dice cannot be regarded as an unbiased one and find the limits between which the probability of a throw of 3 or 4 lies. 5M

(b) Random samples of 400 men and 600 women were asked whether they would like to have a flyover near their residence. 200 men and 325 women were in favour of the proposal. Test the hypothesis that proportions of men and women in favour of the proposal are same against that they are not, at 5% level. 5M

10 (a) The theory predicts the proportion of beans in the four groups A, B, C and D to be 9:3:3:1. In an experiment among 1600 beans, the numbers in the four groups were 882, 313, 287 and 118. Does the experimental result support the theory? 5M

(b) Fit a Poisson distribution to the following data and test the goodness of fit. 5M

X	0	1	2	3	4	5	6
f	275	72	30	7	5	2	1

OR

11 (a) A die is thrown 60 times with the following results. 5M

Face	1	2	3	4	5	6
Frequency	8	7	12	8	14	11

Test at 5% level of significance if the die is honest; assuming that $P(\chi^2 > 11.1) = 0.05$ with 5 degrees of freedom.

(b) Children having one parent of blood-type M and the other type N will always be one of the three types M, MN, N and average proportions of these are 1:2:1. Out of 300 children having one M parent and one N parent, 30% were found to be of type M, 45% of type MN and the remaining of type N. Use χ^2 to test the hypothesis. 5M

*****

Code: 20A54202

R20

B.Tech I Year II Semester (R20) Supplementary Examinations February 2023

PROBABILITY & STATISTICS

(Common to CS, CSE, CS&D, IT, CSE (AI&ML), CSE (DS), CSE (IoT), CSE (AI), AI&DS and AI&ML)

Time: 3 hours   Max. Marks: 70

PART – A

(Compulsory Question)

*****

1 Answer the following: (10 X 02 = 20 Marks)

(a) What is Skewness and write the absolute measure of skewness? 2M

(b) What is principle of least squares? 2M

(c) What will happen to P (A/B), if A and B are independent events' 2M

(d) Write axiomatic definition of probability. 2M

(e) Define continuous distribution. 2M

(f) Find the mean and variance of the random variable X, if $f(x)=e^{-x}(x>0)$, where $f(x)$ is the density of X. 2M

(g) Define Type-I and Type-II error. 2M

(h) Discuss interval estimation with example. 2M

(i) Write the test statistic to test difference of means. 2M

(j) What is the purpose of F-test and $\chi^2 - test$? 2M

PART – B

(Answer all the questions: 05 X 10 = 50 Marks)

2 (a) Compute the regression line of y on x from the following data:
(1, 5), (2, 4), (3, 3), (4, 2), (5, 1) 5M

(b) If two regression coefficients are 0.8 and 0.2, what would be the value of coefficient of correlation? 5M

OR

3 (a) A random sample of 5 college students is selected and their grades in mathematics and statistics are found to be: 5M

	1	2	3	4	5
Mathematics	85	60	73	40	90
Statistics	93	75	65	50	80

Calculate rank correlation coefficient.

(b) Calculate the Karl Pearson coefficient of the following data:
(4, 2), (6, 3), (8, 4), (10, 6), (12, 10) 5M

4 (a) If A, B, C are mutually independent events then $A \cup B$ and C are also independent. 5M

(b) If two dice are thrown, what is the probability that the sum is: (i) greater than 8, and (ii) neither 7 nor 11. 5M

OR

5 (a) For any two events A and B, prove that $P(A \cap B) \leq P(A) \leq P(A \cup B) \leq P(A)+P(B)$. 5M

(b) If the probability of producing a defective screw is $P=0.01$. What is the probability that a lot of 100 screws will contain more than 2 defectives? 5M

Contd. in page 2