UNIT – IV

8. (a) A set of five similar coins is tossed 320 times and the result is

No. of heads	:	0	1	2	3	4	5
Frequency	:	6	27	72	112	71	32

Test the hypothesis that the data follow a binomial distribution. (6M) CO4

(b) In a test given to two groups of students, the marks obtained are as follows:

First Group	:	18	20	36	50	49	36	34	49	41
Second Group	:	29	28	26	35	30	44	46	-	-

Examine the significance of difference between the mean marks secured by the students of the above two groups. (The value of t at 5% level for 14 degree of freedom = 2.14). (6M) CO4

(OR)

9. (a) A group of 5 patients with medicine A weights: 42, 39, 48, 60 and 41 kg. In the light of the above data, discuss the suggestion that mean weight of the population is 48 kg. Test at 5% level of significance.
(Given the table value of t for 4 degree of freedom at 55 level is 2.77%). (6M) CO4

(b) A sample survey of tax payers belonging to business class and professional class yielded the following results:

	Business Class	Professional Class
Sample Size	N1 = 400	N2 = 420
Default in tax payment	X1 = 80	X2 = 65

Test the hypothesis that the defaulters' rate is the same for the two classes of tax payers. (Use α = 0.05 level of significance). (6M) CO4

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CSE/IT

Hall Ticket Number:

CS/IT211(R18)

B.TECH. DEGREE EXAMINATION, DECEMBER-2020

Semester III [Second Year] (Regular & Supplementary)

MATHEMATICS-III

Time: Three hours Maximum Marks: 60

Answer Question No.1 compulsorily. (12 x 1 = 12)
Answer One Question from each unit. (4 x 12 = 48)

1. Answer the following:
   - (a) If X is the Random Variable representing the outcome of roll of an ideal die. What is E(X)? CO1
   - (b) Write formula for r^{th} Moment for Discrete Random Variable? CO1
   - (c) Two Coins are tossed. What is the expectation of the number of tails? CO1
   - (d) What is the variance of Poisson Distribution with parameter λ=2. CO2
   - (e) If X is a Binomial Variate with p=0.2 for the experiment of 50 trials. Then what is its Standard Deviation? CO2
   - (f) Write Density function of the Gamma Distribution. CO2
   - (g) If X & Y are Independent, what is the correlation co-efficient between X & Y? CO3
   - (h) Describe principle of least squares. CO3
   - (i) Write the Normal Equations for fitting exponential curves $Y = ab^x$. CO3
   - (j) Explain Null Hypothesis and Alternative Hypothesis. CO4
   - (k) Write the statistic for test concerning difference between two standard deviations. CO4
   - (l) What are the conditions for using chi-square test as a goodness of fit? CO4

UNIT – I

2. (a) The probability density function of a variable X is (6M) CO1

X	:	0	1	2	3	4	5	6
P(X)	:	k	3k	5k	7k	9k	11k	13k

(i) Find $P(X < 4)$, $P(X \geq 5)$, $P(3 < X \leq 6)$.

(ii) What will be the minimum value of k so that $P(X \leq 2) > 0.3$

(b) A variable X has the probability distribution

X	:	-3	6	9
P(X=x)	:	1/8	½	1/3

Find E(X) and $E(X^2)$. Hence evaluate $E(2X+1)^2$, V(X). (6M) CO1

(OR)

3. (a) Show function defined as follows a density function

$$f(x)=\begin{cases} e^{-x}\ x \geq 0 \\ 0,\ x < 0 \end{cases}$$

Determine the probability that the variable having this density will fall in the interval (1, 2). (6M) CO1

(b) A random variable gives measurements X between 0 and 1 with a probability function.

$$f(x)=\begin{cases} 12x^3-21x^2+10x,\ 0\leq x\leq 1 \\ 0 \end{cases}$$

(i) Find $P(X \leq ½)$ and $P(X > ½)$

(ii) Find a number k such that $P(X \leq k) = ½$ (6M) CO1

UNIT – II

4. (a) If the chance that one of the ten telephone lines is busy at an instant is 0.2. (6M) CO2

(i) What is the chance that 5 of the lines are busy?

(ii) What is the most probable number of busy lines and what is the probability of this number?

(iii) What is the probability that all the lines are busy?

(b) If the probability of a bad reaction from a certain injection is 0.001, determine the chance that out of 2,000 individuals more than two will get a bad reaction. (6M) CO2

(OR)

5. (a) X is a normal variate with mean 30 and S.D. 5, find the probabilities that

(i) $26 \leq X \leq 40$ (ii) $X \geq 40$ (iii) $|X-30| > 5$ (6M) CO2

(b) Find the mean and standard deviation of Poisson distribution. (6M) CO2

UNIT – III

6. (a) Fit a straight line to the following data. (6M) CO3

X:	1	2	3	4	6	8
Y:	2.4	3	3.6	4	5	6

(b) Calculate the rank correlation coefficient from the following data showing ranks of 10 students in two subjects: (6M) CO3

Mathematics:	3	8	9	2	7	10	4	6	1	5
Physics:	5	9	10	1	8	7	3	4	2	6

(OR)

7. (a) Find the coefficient of correlation between industrial production and export using the following data and comment on the result. (6M) CO3

Production (in crore tons)	:	55	56	58	59	60	60	62
Exports (in crore tons)	:	35	38	38	39	44	43	45

(b) Fit an exponential curve of the form $Y = ab^x$ to the following data: (6M) CO3

X	:	1	2	3	4	5	6	7	8
Y	:	1.0	1.2	1.8	2.5	3.6	4.7	6.6	9.1

(b) A manufacturer claims that any of his list of items cannot have variance more than 1 cm^2. A sample of 25 items has a variance of 1.2 cm^2. Test whether the claim of the manufacturer is correct. (6M) CO4

(OR)

9. (a) A manufacturer claimed that atleast 95% of the equipment which he supplied to a factory conformed to specifications. An examination of a sample of 200 pieces of equipment reveled that 18 were faulty. Test his claim at 5% level of significance. (6M) CO4

(b) A machine is designed to produce insulating washers for electrical devices of average thickness of 0.025 cm. A random sample of 10 washers was found to have a thickness of 0.024 cm with a S.D of 0.002 cm. Test the significance of the deviation. Value of t for 9 degrees of freedom at 5% level is 2.262. (6M) CO4

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Hall Ticket Number:

B.TECH. DEGREE EXAMINATION, MARCH-2021

Semester III [Second Year] (Regular & Supplementary)

MATHEMATICS-III

Time: Three hours Maximum Marks: 60

Answer Question No.1 compulsorily. (12 x 1 = 12)
Answer One Question from each unit. (4 x 12 = 48)

1. Answer the following:

(a) A random variable X has the following probability distribution. Find E(X)

X=x	-3	6	9
P(X=x)	1/6	½	1/3

CO1

(b) Define probability mass function. CO1

(c) Find the value of k, if $f(x)=\begin{cases} kx^3, & 0\le x\le 3 \\ 0, & elsewhere \end{cases}$ represents a probability density function. CO1

(d) The probability density function is $f(x)=\frac{x^2}{9}, 0<x<3$ then the mean of the distribution is ______ CO2

(e) Write any two examples comes under Binomial distribution. CO2

(f) If the probability of a defective bolt is 0.2, write the value of the mean for the distribution of bolts in a trail of 400 CO2

(g) Write any two properties of Poisson distribution. CO3

(h) Write any two chief characteristics of normal distribution. CO3

(i) If $y=a_0+a_1x+a_2x^2$, then the third normal equation by least squares method is $\sum_i x_i^2 y_i = -----$ CO3

(j) Write the formula for Karl pearson's coefficient of correration. CO4

(k) A hypothesis is true, but is rejected, this is an error of type ______ CO4

(l) The t-test is applicable to samples for which n is ______ CO4

UNIT – I

2. (a) Two dice are thrown. Let X assign to each (a, b) in S the maximum of its numbers i.e., X(a, b). Find the probability distribution. X is a random vaiable with X(s) = {1, 2, 3, 4, 5, 6}. Also find the mean and variance of the distribution (6M) CO1

(b) If the probability density of a random variable is given by $f(x)=\begin{cases} k(1-x^2), & for\, 0<x<1 \\ 0, & otherwise \end{cases}$ find the value of k and the probabilities that a random variable having this probability density will take on a value (i) between 0.1 and 0.2 (ii) greater than 0.5. (6M) CO1

(OR)

3. (a) A random variable X has the following probability function

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

(i) Determine k (ii) Evaluate P(X<6) (iii) If $P(X\le k)>\frac{1}{2}$ find the minimum value of k. (6M) CO1

(b) The probability density f(x) of a continuous random variable is given by $f(x)=ce^{-|x|}, -\infty<x<\infty$. Show that c=1/2 and find the mean and variance of the distribution. (6M) CO1

UNIT – II

4. (a) Two dice are thrown five times. Find the probability of getting 7 as sum (i) at least once (ii) two times (iii) P(1<X<5). (6M) CO2

(b) Find the mean and variance of a Poisson Distribution. (6M) CO2

(OR)

5. (a) Write the importance and applications of the Normal distribution. (6M) CO2

(b) Derive the formulas for mean and variance of Gamma distribution. (6M) CO2

UNIT – III

6. (a) Find karl Pearson's coefficient of correlation from the following data:

Wages	100	101	102	102	100	99	97	98	96	95
Cost of Living	98	99	99	97	95	92	95	94	90	91

(6M) CO3

(b) Calculate the regression equations of Y on X from the data given below, taking deviations from actual means of X and Y.

Price (Rs)	10	12	13	12	16	15
Amount Demanded	40	38	43	45	37	43

(6M) CO3

(OR)

7. (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

(6M) CO3

(b) Fit a polynomial second degree to the data points given in the following table:

x	0	1	2
y	1	6	17

(6M) CO3

UNIT – IV

8. (a) In a random sample of 60 workers, the average time taken by them to get to work is 33.8 minutes with a standard deviation of 6.1 minutes. Can we reject the null hypothesis $\mu=32.6$ minutes in favour of alternative null hypothesis $\mu>32.6$ at $\alpha=0.025$ level of significance. (6M) CO4

(b) A set of five similar coins is tossed 320 times and the result is

No.of heads	0	1	2	3	4	5
Frequency	6	27	72	112	71	32

Test the hypothesis that the data follow a binomial distribution. (6M)

(OR)

9. (a) A random sample of 100 recorded deaths in a country showed an average life span of 71.8 years. Assuming a population standard deviation of 8.9 years, does this seem to indicate that the mean life span today is greater than 70 years? Use a 0.05 level of significance. (6M)

(b) A study shows that 16 of 200 tractors produced on one assembly line required extensive adjustments before they could be shipped, while the same was true for 14 of 400 tractors produced on another assembly line. At the 0.01 level of significance, does this support the claim that the second production line does superior work? (6M)

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Hall Ticket Number:

CS/IT211(R18)

B.TECH. DEGREE EXAMINATION, FEBRUARY-2020

Semester III [Second Year] (Supplementary)

MATHEMATICS-III

Time: Three hours Maximum Marks: 60

Answer Question No.1 compulsorily. (12 x 1 = 12)
Answer One Question from each unit. (4 x 12 = 48)

1. Answer the following:
   (a) Define random variable.
   (b) Write formula for variance of a continuous random variable.
   (c) State Chebyshev's inequality.
   (d) Find the standard deviation of a binomial distribution with n = 16 and p = 0.5.
   (e) If X is normally distributed with mean 30 and standard deviation 5, find
   P(X-30) > 5).
   (f) Write density function of the gamma distribution.
   (g) Write the regression line of x on y.
   (h) Write formula for rank correlation.
   (i) Write normal equations of fitting a straight line.
   (j) Define population.
   (k) Define null hypothesis.
   (l) Write the statistic for test concerning single proportion.

UNIT – I

2. (a) A random variable X has the following probability distribution.

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

(i) Find k (ii) Evaluate $P(X<6)$ and $P(0<X<5)$. (6M)

(b) The probability distribution of a discrete random variable X is $f(x)=\binom{3}{x}\left(\frac{1}{4}\right)^{x}\left(\frac{3}{4}\right)^{3-x}$, $x=1,2,3.$ Find the mean of X. (6M)

(OR)

3. (a) If the probability density of a random variable is given by $f(x)=\begin{cases}kx^3, 0<x<1\\ 0, \textit{elsewhere}\end{cases}$ find the value of k and the probability that the random variable takes on a value (a) between $\frac{1}{4}$ and $\frac{3}{4}$ (ii) greater than $\frac{2}{3}$. (6M)

(b) Suppose a continuous random variable X has the following density $f(x)=\begin{cases}k(1-x^2),\ 0<x<1\\ 0, \textit{else where}\end{cases}$

Find (i) k (ii) Mean (iii) Variance. (6M)

UNIT – II

4. (a) Find the mean and variance of binomia distribution. (6M)

(b) If 0.8% of the fuses delivered to an arsenal are defective, use Poisson approximation to determine the probability that 4 fuses will be defective in a random sample of 400. (6M)

(OR)

5. (a) The burning time of an experimental rocket is a random variable having the normal distribution with mean 4.6 seconds and standard deviation 0.04 second. What is the probability that this kind of rocket will burn (6M)

(i) Less than 4.66 seconds (ii) more than 4.80 seconds (iii) anywhere from 4.70 to 4.82 seconds.

(b) The amount that a surveillance camera will run without having to be reset is a random variable having the exponential distribution with $\beta = 50$ days. Find the probability that such a camera will (i) have to be reset in less than 20 days (ii) not have to be reset in atleast 60 days. (6M)

UNIT – III

6. (a) Find the coefficient of correlation between industrial production and export using the following data and comment on the result. (6M)

Production (in crores tons)	55	56	58	59	60	60	62
Exports (in crores tons)	35	38	38	39	44	43	45

(b) Fit a second degree parabola to the following data using the method of least squares. (6M)

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

(OR)

7. (a) For a set of values of x and y, the two regression lines are 31x – 37y +5 = 0, and 50x – 36y – 612 = 0. Identify the regression line of y on x and that of x on y. Also obtain the values of $\bar{x}$, $\bar{y}$ and r. (6M)

(b) Find the curve $y = ae^{bx}$ for the following data: (6M)

x	1	2	3	4	5	6
y	1.6	4.5	13.8	40.2	125	300

UNIT – IV

8. (a) It is claimed that a vacuum cleaner uses an average of 46 kilowatt hours per year. If a random sample of 12 homes indicates that the vacuum cleaners use a average of 42 kilowatt hours per year with a standard deviation of 11.9 kilowatt hours, does this suggest at 0.05 level of significance that vacuum cleaners use on average less than 46 kilowatt hours annually (assume that the populations of kilowatt hours is normal). (6M)

UNIT – IV

8. (a) Fit a Poisson distribution to the following data and test for its goodness of fit at level of significance 0.05. (6M)

X	:	0	1	2	3	4
Y	:	419	352	154	56	19

(b) The two independent samples of 8 and 7 items gave the following values:

Sample A	:	9	11	13	11	15	9	12	14
Sample B	:	10	12	10	14	9	8	10	-

Examine whether the difference between the means of two samples is significant at 5% level. (6M)

(OR)

9. (a) A random sample of 9 boys had heights (inches): 45, 47, 50, 52, 48, 47, 49, 53 and 51. In the light of the data, discuss the suggestion that the mean height in the population is 47.5. (Given the table value of t for 8 Degree of Freedom at 5% level = 2.306). (6M)

(b) A market researcher engaged by a particular company believes that the proportion of households using company' s products in city A exceeds this proportion in city B by 0.05. The researcher conducts survey of two cities and finds the following results:

City A	Sample Size	No. of households using company's products
A	n1 = 160	120
B	n2 = 150	100

Use 0.05 level of significance and test the researcher's claim. (6M)

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Hall Ticket Number:

CS/IT211(R18)

B.TECH. DEGREE EXAMINATION, OCTOBER-2019

Semester III [Second Year]

MATHEMATICS-III

Time: Three hours Maximum Marks: 60

Answer Question No.1 compulsorily. (12 x 1 = 12)
Answer One Question from each unit. (4 x 12 = 48)

1. Answer the following:
   (a) If a Random experiment E consists of tossing a pair of dice, Let X be the sum of two numbers that turn up. What is $P(X\geq 10)$?
   (b) State Chebyshev's Inequality.
   (c) Write down the relation between Variance and Expectation.
   (d) Under what conditions will Binomial distribution tend to Poisson Distribution?
   (e) Write density function of Normal Distribution.
   (f) In a Poisson Distribution, if $2P(X=1) = P(X=2)$, then What is the Variance?
   (g) Define Rank Correlation.
   (h) If the two Regression lines coincide then what is the coefficient of Correlation.
   (i) Write the regression line of y on x.
   (j) State the Null and Alternative Hypothesis regarding the population mean that lead to test
       (i) Left-tailed test (ii) Right-tailed test
   (k) Define Acceptance and Rejection Region.
   (l) Discuss the uses of chi-Square Test.

UNIT – I

2. (a) A random variable X has the following probability function: (6M)

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 the value of the k

(ii) Evaluate $P(X < 6)$, $P(X \geq 6)$

(iii) $P(0 < X < 5)$

(b) In a lottery, m tickets are drawn at a time out of n tickets numbered from 1 to n. Find the expected value of the sum of the numbers on the tickets drawn. (6M)

(OR)

3. (a) Calculate the mean and standard deviation of the probability density function $f(x)=\begin{cases} \frac{1}{4}e^{-x/4} & \text{for } x>0 \\ 0 & \text{elsewhere} \end{cases}$ (6M)

(b) A function is defined as follows:

$$f(x)=\begin{cases} 0, & x<2 \\ \frac{1}{18}(2x+3), & 2\leq x\leq 4 \\ 0, & x>4 \end{cases}$$

Show that it is a density function. Find the probability that a variable having density will fall in the interval $2 \leq x \leq 3$? (6M)

UNIT – II

4. (a) The probability that a pen manufactured by a company will be defective is 1/10. If 12 such pens are manufactured, find the probability that (6M)

(i) Exactly two will be defective.

(ii) At least two will be defective.

(iii) None will be defective.

(b) X is a Poisson variable and it is found that the probability that X = 2 is two-thirds of the probability that X = 1. Find the probability that X = 0 and the probability that X = 3. What is the probability that X exceeds 3? (6M)

(OR)

5. (a) For a normally distributed variate with mean 1 and S.D. 3, find the probabilities that

(i) $3.43 \leq x \leq 6.19$ (ii) $-1.43 \leq x \leq 6.19$ (6M)

(b) Show that for the Gamma distribution $f(x)=\frac{e^{-x}x^{l-1}}{\Gamma(l)}, 0<x<\infty$ the mean and variance are both equal to l. (6M)

UNIT – III

6. (a) Find the rank correlation for the following data: (6M)

X:	56	42	72	36	63	47	55	49	38	42	68	60
Y:	147	125	160	118	149	128	150	145	115	140	152	155

(b) Fit a parabola of second degree to the following data: (6M)

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

(OR)

7. (a) Ten people of various heights as under were requested to read the letters on a car at 25 yards distance. The number of letters correctly read is given below: (6M)

Height (in feet)	:	5.1	5.3	5.6	5.7	5.8	5.9	5.10	5.11	6.0	6.1
No. of letters	:	11	17	19	14	8	15	20	6	8	12

Is there any correlation between heights and visual power?

(b) For the data given below, find the equation to the best fitting exponential curve of the form $y=ae^{bx}$. (6M)

x:	1	2	3	4	5	6
y:	1.6	4.5	13.8	40.2	125.0	300.0