Q.P Code: MA21028S   Hall Ticket No.

NARSIMHAREDDY ENGINEERING COLLEGE
(UGC AUTONOMOUS)
II B.Tech I Semester (NR20) Supplementary Examination, July 2024
PROBABILITY AND STATISTICS
(Civil Engineering)

Time : 3 hours   Maximum marks: 75

Note:
- This question paper contains two parts, A and B
- Part A is compulsory which carries 25 marks. (1ˢᵗ 5 sub questions are one from each unit carry 2 Marks each & Next 5 sub questions are one from each unit carry 3 Marks) Answer all questions in Part A
- Part B Consists of 5 Units. Answer one question from each unit. Each question carries 10 Marks and may have a, b sub questions

Part-A
Answer all questions   (25 Marks)

Q.No		Question	M	CO	BL.
i)	a	Define independent event	2	CO1	L1
	b	Define continuous random variables.	2	CO1	L1
	c	Write the mean & variance of the binomial distribution	2	CO2	L2
	d	Define poisson distribution.	2	CO3	L1
	e	Write and two properties of Normal distribution.	2	CO3	L1
	f	Define Gamma distribution.	3	CO3	L1
	g	Define curve fitting	3	CO4	L1
	h	Define Regression.	3	CO5	L1
	i	What is the null hypothesis.	3	CO5	L1
	j	Write the test statistic for difference of proportion in large sample.	3	CO5	L2

Part-B
Answer all the Units
All Questions carry equal Marks   (50 Marks)

Q.No	Question	M	CO	BL.
	UNIT-I			
2)	In a bolt factory machines A, B, C manufacture 20%, 30%, 50% total of their output and 6%, 3%, 2% are defective. A bolt is drawn at random and found to be defective. Find the probability that from C.	10	CO1	L4
	OR			
3)	A random variable has the following probability function Determine i) k; ii) Mean iii)Variance iv) Pr(2< X < 6)	10	CO1	L3

X	0	1	2	3	4	5	6	7
P(X₁)	0	K	2K	2K	3K	K²	2K²	7K²+K

| | **UNIT-II** | | | |
| 4) | Fit a binomial distribution to the following data | 10 | CO2 | L4 |

x	0	1	2	3	4	5
f	2	14	29	34	22	8

	OR			
5)	Derive the mean & variance of poisson distribution	10	CO2	
	UNIT-III			
6)	In a normal distribution 31% of the items are under 45 and 8% of the items are over 64. Find mean and variance of the distribution	10	CO3	
	OR			
7)	A random variable X is normally distributed with mean 30 and SD 5. Find the probabilities that i)26 < X < 40 ii) X > 45	10	CO3	
	UNIT-IV			
8)	Fit a straight line y = ax + b for the following data	10	CO4	

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

| | **OR** | | | |
| 9) | The heights of mothers & daughters are given in the following table. From the 2 tables of regression estimate the expected average height of daughter when the height of the mother is 64.5 inches. | 10 | CO4 | |

Mother	62	63	64	64	6	66	67	70
Daughter	64	65	61	69	67	68	71	65

	UNIT-V			
10)	An ambulance service claims that it takes on the average less than 10 minutes to reach its destination in emergency calls. A sample of 36 calls has a mean of 11 minutes and the variance of 16 minutes. Test the claim at 0.05 level	10	CO5	
	OR			
11)	A random sample of size 16 values from a normal population showed a mean of 53 and sum of squares of deviations from the mean equals to 150. Can this sample be regarded as taken from the population having 56 as mean? Obtain 95% confidence limits of the mean of the population?	10	CO5	

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R18

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech II Year I Semester Examinations, October - 2020
PROBABILITY AND STATISTICS
(Civil Engineering)

Time: 2 Hours   Max. Marks: 75

Answer any five questions
All questions carry equal marks
- - -

1.a)   The Probabilities that students A,B,C and D solve a problem are $\frac{1}{3}, \frac{2}{5}, \frac{1}{5} \text{ and } \frac{1}{4}$ respectively. If all of them try to solve the problem, what is the probability that the problem is solved?

 b)   A continuous Random variable has the p.d.f $f(x) = \begin{cases} K(1-x^2), & if \quad 0 \le x \le 1 \\ 0, & otherwise \end{cases}$

      Determine: i) K   ii) The mean   iii) Variance.   [8+7]

2.a)   Three machines I, II and III produce 20%,25% and 55% of the total number of items of a factory. The percentages of defective items of these machines are 7%, 3% and 3%. An item is selected at random and found to be defective. Find the probability that it is from
      i) Machine- I   ii) Machine-II   iii) Machine-III

 b)   If a random variable has the probability density function $f(x) = \begin{cases} 2e^{-2P}, & for \quad x > 0 \\ 0, & for \quad x \le 0 \end{cases}$

      Find the probabilities:
      i) P(1< x < 3)   ii) P(x ≥ 0.5).   [8+7]

3.a)   Six cards are drawn from a pack of 52 cards. Getting a diamond is a success. Find the probability of getting the success
      i) At least once   ii) 4 times
 b)   If the variance of a Poisson variate X is 2, find the probability that
      i) X = 0   ii) 1< X < 4   [8+7]

4.a)   Asumming that half of the population are consumer of rice and X represent the number of individuals consuming rice, if 8 individuals are taken find the probability that
      i) X ≥ 2   ii) 1≤ X ≤4.
 b)   If x is a Poisson variate such that 3P(x=4)=1/2P(x=2)+P(x=0)
      Find   i) μ   ii) P(x ≤ 2)   [8+7]

5.a)   On an average, a certain computer part lasts in ten years. The length of time the computer part lasts is exponentially distributed. What is the probability that a computer part lasts more than 7 years?
 b)   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   [7+8]

6. 800 students appear for an examination. It was found that the marks are normally distributed with mean 60 and standard deviation 12. The division/classes are per the marks secured were given as follows

Marks (m)	M < 40	$40 \leq m < 50$	$50 \leq m < 60$	$60 \leq m < 75$	$m \geq 75$
Division/class	Fail	3rd division	2nd division	1st class	Distinction

Find the number of students who
a) Get 1st division   b) get 3rd division   c) Failed.   [15]

7. Fit the curve of the form $y = ae^{bx}$ for the following data   [15]

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

8.a) 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.

b) Two independent random samples of sizes 100 and 120 have means 50 and 60 with S.D of 5 and 6. Construct 95% confidence interval for the difference of two means.   [7+8]

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, March - 2022
PROBABILITY AND STATISTICS
(Civil Engineering)

Time: 3 Hours   Max. Marks: 75

Answer any five questions
All questions carry equal marks
- - -

1.a) Two digits are selected at random from the digits 1 through 9.
    i) If the sum is odd, what is the probability that 2 is one of the digit selected.
    ii) If 2 is one of the digits selected, what is the probability that the sum is odd?
  b) A given lot of product contains 2% defective products. Each product is tested before delivery. The probability that the product is good given that it is actually good is 0.95 and the probability that the product is defective given that it is actually defective is 0.94. If a tested product is defective, what is the probability that it is actually defective?   [7+8]

2.a) A random variable X takes the values -2, -1, 0, 1, 2 such that $P(X = 0) = P(X < 0) = P(X > 0)$. Obtain the probability distribution and the cumulative distribution function of X.
  b) Define the rth moment about mean and r^{th} moment about origin. Express one in terms of the other.   [8+7]

3.a) Derive mean and variance of the Binomial distribution.
  b) A manufacturer of pins knows that 2% of his product is defective. If he sells pins in boxes of 100 and guarantees that not more than 4 pins will be defective. What is the probability that a box will fail to meet the guaranteed quality?
  c) If on an average 1 vessel in every 10 is wrecked, find the probability that out of 5 vessels expected to arrive at least 4 will arrive safely.   [5+5+5]

4.a) If X is a poisson random variable then find the ratio of $P(X = r+1)$ and $P(X = r)$.
  b) Show that for a binomial distribution B(n,p), the mean is np and variance is npq (p+q=1).   [8+7]

5.a) Show that for the exponential distribution $dP = y_0 e^{-x/\sigma}, 0 \le x \le \infty$, the mean and standard deviation are both equal to σ.
  b) A pair of dice is rolled 180 times and their score recorded. Find:
    i) $P(x \le 20)$
    ii) $P(20 < x \le 30)$ [7+8]

6.a) Show that area under the normal curve is unity.
  b) Find the mean and variance of the gamma distribution.   [7+8]

7.a) Fit a regression line of Y on X for the following data and hence predict Y if $X = 67.5$.

X	65	66	67	67	68	69	71	73
Y	67	68	64	68	72	70	69	70

b) Ten participants in a contest are ranked by two judges as follows

x	1	6	5	10	3	2	4	9	7	8
y	6	4	9	8	1	2	3	10	5	7

Calculate the rank correlation coefficient. [7+8]

8.a) The owner of a machine shop must decide which of two snack vending machines to install in his shop. If each is tested 250 times, the first machine fails to work 13 times and the second machine fails to work 7 times. Test at the 0.05 level of significance whether the difference between the corresponding sample proportions is significant.

b) A random sample of boots worn by 40 combat soldiers in a desert region showed an average life of 1.08 years with a standard deviation of 0.05 years. Under standard conditions the boots are known to have an average life of 1.28 years. Is there reason to assert at a level of significance of 0.05 that use in the desert causes the mean life of such boots to decrease? [7+8]

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, March - 2021
PROBABILITY AND STATISTICS
(Civil Engineering)

Time: 3 hours

Max. Marks: 75

Answer any five questions
All questions carry equal marks

- - -

1.a) A researcher has to consult a recently published work. The probability of its being available is 0.5 for library A and 0.7 for library B. Assuming the two events to be statistically independent, find out the probability of the book being available in library A and not available in B?

b) State Baye's theorem. In a population of workers, suppose 40% are school graduates, 50% are high school graduates, and 10% are college graduates. Among the school graduates, 10% are unemployed; among the high school graduates, 5% are unemployed, and among the college graduates 2% are unemployed. If a worker is chosen at random and found to be unemployed, what is the probability that he is from?
i) Scool graduate   ii) Highschool graduate   iii) College graduate.   [7+8]

2.a) A random variable X has the probability law $f(x) = Ax^2, 0 \le x \le 1$, then (i) determine A (ii) find the probability that X lies between 0.2 and 0.5 and (iii) the mean of X.

b) If the mean of a poisson distribution is 1 find i) $P(x=0)$ ii) $P(1 < x \le 4)$ iii) $P(x=2)$.
     [8+7]

3. Fit a Poisson distribution to the following data and calculate the theoretical frequencies: [15]

x:	0	1	2	3	4
f:	123	59	14	3	1

4. The mean of a normal distribution is 77.0. Find the standard deviation if 20% of the area under the curve lies to the right of 90.0.   [15]

5. From the following data calculate the rank correlation coefficient after making adjustment for tied ranks.   [15]

x:	48	33	40	9	16	16	65	24	16	57
y:	13	13	24	6	15	4	20	9	6	19

6.a) Fit a least square straight line to the following data and estimate y when $x = 10$.

x:	4	3	2	9	6	1	8	4	16	57
y:	13	12	11	16	15	14	12	9	6	8

b) The two lines of regression are $3X + 2Y = 26$ and $6X + Y = 31$. Find (i) the mean of X and Y (ii) the coefficient of correlation between X and Y.   [7+8]

7.a) A die is thrown 9000 times and a throw of 3 or 4 is observed 3240 times. Show that the die cannot be regarded as an unbiased one.

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

First group	19	20	35	50	48	36	34	50	40
Second group	29	28	25	34	29	43	45	45	49

Examine the significance of the difference between the arithmetic mean of the marks secured by the students of the above two groups. [7+8]

8. The nicotine content (in milligrams) of two samples of tobacco were found to be as follows:

Sample A	24	27	26	21	25	
Sample B	27	30	28	31	22	36

Can it be concluded that the two samples come from the same normal population? [15]

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R18

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech II Year I Semester Examinations, December - 2019
PROBABILITY AND STATISTICS
(Civil Engineering)

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 as sub questions.

PART – A
(25 Marks)

1.a) Ten coins are tossed simultaneously. Find the probability that of getting No head. [2]

  b) State the assumptions of Binomial probability distribution [2]

  c) If the probability density function of a continuous random variable is
$$f(x) = \begin{cases} K.e^{Kx}, & x > 0, K > 0 \\ 0, & elsewhere \end{cases}$$. Find K. [2]

  d) Explain briefly about method of least square. [2]

  e) What is meant by a statistical hypothesis? [2]

  f) If $P(A) = P(B) = P(A \cap B)$, prove that $P(A \cap \bar{B} + \bar{A} \cap B) = 0$. [3]

  g) Find the mean and variance of the distribution $f(x) = e^{-x}, x > 0$. [3]

  h) Derive the mean of the Exponential Distribution. [3]

  i) Derive the normal equations for the straight line $y = a + bx$ by least squares. [3]

  j) Explain types of errors of decision that arise in testing a hypothesis? [3]

PART – B
(50 Marks)

2.　Two dice are thrown X assigned to the number of heads is a random variable.
　a) Write the distribution
　b) Find mean
　c) Find variance. [10]

OR

3.　If the p.d.f of a continuous random variable is
$$f(x) = \frac{1}{2}\sin x, 0 \le x \le \pi$$

Find:　a) mean　　　b) Mode　　　c) $P\left(0 \le x \le \frac{\pi}{2}\right)$ [10]

4.a) Prove that Poisson distribution is the limiting case of Binomial distribution.

  b) 10 cards are selected from a pack of 52 cards. Find the probability that there are:
　i) Atleast one diamond　　　ii) $P(1 \le x < 4)$ [5+5]

OR

5.a) The chance of an individual being a consumer is 1/2. Assuming that 100 investigators each take 10 individuals to see whether they are consumers of rice, how many investigators would you expect to report that 3 people or less were consumers of rice?

b) A manufacturer of pins knows that 2% of his product is defective. If he sells pins in boxes of 100 and guarantees that not more than 4 pins will be defective. What is the probability that a box will fail to meet the guaranteed quality? [5+5]

6.a) The masses of 500 students is normally distributed with mean 70 kgs with a S.D of 3 kgs. Find the number of students whose mass:
i) lie between 65 and 73   ii) Less than 66

b) Find the probability of getting 1 or 4 or 5 or 6 in throwing a die 5 to 7 times among 9 trials using normal distribution. [5+5]

OR

7. Show that for normal distribution the quartile deviation, mean deviation and standard deviation are approximately 10:12:15. [10]

8. Estimate y at $x = 5$ by fitting a least squares curve of the form $y = \dfrac{b}{x(x-a)}$ to the following data [10]

x	3.6	4.8	6.0	7.2	8.4	9.6	10.8
y	0.83	0.31	0.17	0.10	0.07	0.05	0.04

OR

9. Calculate the correlation coefficient and the lines of regression from the following data: [10]

X	62	64	65	69	70	71	72	74
Y	126	125	139	145	165	152	180	208

10. The owner of a machine shop must decide which of two snack vending machines to install in his shop. If each is tested 250 times, the first machine fails to work 13 times and the second machine fails to work 7 times. Test at the 0.05 level of significance whether the difference between the corresponding sample proportions is significant. [10]

OR

11. In a certain city 125 men in a sample of 500 were found to be smokers. In another city, the number of smokers was 375 in a random sample of 1000. Does this indicate that there is a greater population of smokers in the second city than in the first? [10]

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