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| **SIDDARTHA INSTITUTE OF SCIENCE AND TECHNOLOGY :: PUTTUR**  Siddharth Nagar, Narayanavanam Road – 517583  **QUESTION BANK (DESCRIPTIVE)**  **Subject with Code: PROBABILITY&STATISTICS**(**18HS0835**) **Branches**:**MECH,CSE**  **Year &Sem:** II-B.Tech&I-Sem **Regulation:** R18 |

**UNIT –I**

1. a) If , . [2 M]

b) If ,. [2 M]

c) State Bayes theorem. [2 M]

d) If the Probability density of a random variable is given by 

find the value of k. [2 M]

e) A random variable X has the following probability function

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| x | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| P(x) | 1/36 | 2/36 | 3/36 | 4/36 | 5/36 | 6/36 | 7/36 | 8/36 |

find the value of P(x≤2) [2 M]

1. a) A class consists of 6 girls and 10 boys. If a committee of 3 is chosen at random from the class,

find the Probability that (i)3 boys are selected (ii)exactly 2 girls are selected [4 M]

b) Two cards are selected at random from 10 cards numbered 1 to 10. Find the probability that

the sum is even if (i) The two cards are drawn together. (ii) The two cards drawn one after

other with replacement. [6 M]

1. a) Three students A,B,C are in running race. A and B have the same Probability of winning and

each is twice as likely to win as C. Find the Probability that B or C wins [5 M]

b) Determine (i)  (ii)  if A and B are events with ,  ,

. [5 M]

1. a) In a certain town 40% have brown hair, 25% have brown eyes and 15% have both brown hair

and brown eyes. A person is selected at random from the town.

i) If he has brown hair, what is the probability that he has brown eyes also?

ii )If he has brown eyes, determine the probability that he does not have brown hair? [6 M]

b) The probability that students A,B,C,D solve the problem are , ,  and respectively If

all of them try to solve the problem, what is the probability that the problem is solved. [4M]

1. Two dice are thrown. Let A be the event that the sum of the point on the faces is 9. Let B be the event

that at least one number is 6.Find (i) P(AB) (ii) P(AB) (iii) P(AcBc) (iv) P(AcBc)

(v) P(A) [10 M]

1. In a certain college 25% of boys and 10% of girls are studying mathematics. The girls Constitute 60% of the student body. (a) What is the probability that mathematics is being studied? (b) If a student is selected at random and is found to be studying mathematics, find the probability that the student

is a girl? (c) a boy [10 M]

1. Two dice are thrown. Let X assign to each point (a,b) in S the maximum of its numbers

i.e, X(a,b)= max (a,b). Find the probability distribution. X is a random variable

with X(s)={1,2,3,4,5,6}. Also find the mean and variance of the distribution. [10 M]

1. A random variable X has the following probability function

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| X | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| P(x) | 0 | K | 2K | 2K | 3K | K2 | 2K2 | 7K2+K |

Determine (i) K (ii) Evaluate P(X6) and P(0<X<5) (iii) if P(XK)>1/2, find the

minimum value of K (iv) variance. [10 M]

1. A) Find the mean and variance of the uniform probability distribution given by  for

 [5 M]

b) If a random variable has a Probability density f(x) as 

Find the Probabilities that it will take on a value (i)Between 1 & 3 (ii)Greater than 0.5 [5 M]

1. Probability density function of a random variable X is . Find the mean, mode and median of the distribution and also find the probability between 0 and . [10 M]

**UNIT-II**

1. a) Define Binomial distribution. [2 M]

b) A fair coin is tossed six times. Find the Probability of getting four heads. [2 M]

c) Define Poisson distribution. [2 M]

d) If a bank received on the average 6 bad cheques per day, find the probability that it will receive

4 bad cheques on any given day. [2 M]

e) Define Normal distribution. [2 M]

1. a) Derive mean and variance of Binomial distribution. [6 M]

b) 20% of items produced from a factory are defective. Find the probability that in a sample of 5

chosen at random (i) one is defective (ii)  [4 M]

1. a) Fit a Binomial distribution to the following frequency distribution: [8 M]

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 0 | 1 | 2 | 3 | 4 | 5 |
|  | 2 | 14 | 20 | 34 | 22 | 8 |

b) The mean and variance of a binomial distribution are 4 and . Find  [2M]

1. a) Out of 800 families with 5 children each, how many would you expect to have (a) 3 boys (b) 5

girls(c) either 2 or 3 boys. Assume equal probabilities for boys and girls. [6M]

b) Two dice are thrown five times. Find the probability of getting 7 as sum i) at least once

(ii)  [4M]

1. a) Derive mean and variance of poisson distribution. [6 M]

b) If 2% of light bulbs are defective. Find the probability that (i) At least one is defective

(ii) in a sample of 100 [4 M]

1. a) Fit a Poisson distribution to the following data [8 M]

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | 0 | 1 | 2 | 3 | 4 | 5 | Total |
|  | 142 | 156 | 69 | 27 | 5 | 1 | 400 |

b) If the mean of a Poisson distribution is 1.8 then find  [2M]

1. a) An insurance agent policies of 5 men all of identical age and good in health. The probability

that a man of this age will be alive 30 years is 2/3. Find the probability that in 30 years.

(i) At least one man (ii) Almostthree will be alive [6M]

b) If X is a Poisson variate such that,

find (i) the mean (ii)  [4 M]

1. Derive mean and variance of Normal distribution. [10 M]
2. Find the mean and variance of a Normal distribution in which 7% of items are under 35

and 89% are under 63. [10 M]

1. In a sample of 1000 cases, the mean of 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 students score above 18? (iii) How many students score below 18? [10 M]

**UNIT-III**

1. a) The weights of 6 competitors in a game are given below 58,62,56,63,55,61kgs.

Find arithmetic mean of weight of competitors. [2M]

b) Find the median of the following values 26,8,6,12,15,32. [2 M]

c) Obtain mode of the values 10,12,15,20,12,16,18,15,12,10,16,20,12,24. [2 M]

d) Write the formulas for correlation, rank correlation [2 M]

e) Write the formulas for the lines of regression X on Y and Y on X. [2 M]

2. a) Find arithmetic mean to the following data using step deviation method [ 5M]

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Marks | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 |
| frequency | 5 | 8 | 25 | 22 | 10 |

b) Find the median to the following data [ 5M]

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| x | 5 | 8 | 11 | 14 | 17 | 20 | 23 |
| f | 2 | 8 | 12 | 20 | 10 | 6 | 3 |

3. a) Find the median to the following data [ 5M]

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Class intervals | 40-50 | 50-60 | 60-70 | 70-80 | 80-90 |
| frequency | 5 | 12 | 23 | 8 | 2 |

b) Find arithmetic mean to the following data [ 5M]

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| x | 1 | 2 | 3 | 4 | 5 |
| f | 5 | 8 | 10 | 12 | 6 |

4. a)Find mode to the following data [ 5M]

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| X | 0-10 | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 | 60-70 |
| F | 4 | 13 | 21 | 44 | 33 | 22 | 7 |

b) The first four moments of a distribution about the value 5 of the variables are 2,20,40 and 50.

Calculate mean,variance,  and  of the distribution. [ 5M]

5. Compute Karl Pearson and Bowley’s coefficient of Skewness to the following data [ 5M]

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Class intervals | 0-10 | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 | 60-70 | 70-80 | 80-90 | 90-100 |
| frequency | 2 | 6 | 11 | 20 | 40 | 75 | 45 | 25 | 18 | 8 |

6. Compute the first four central moments to the following data and also find Sheppard’s correction,

 and  [ 5M]

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Class intervals | 0-10 | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 | 60-70 |
| frequency | 2 | 8 | 12 | 40 | 20 | 15 | 3 |

7. a)Calculate correlation coefficient to the following data [ 5M]

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| X | 10 | 15 | 12 | 17 | 13 | 16 | 24 | 14 | 22 | 20 |
| Y | 30 | 42 | 45 | 46 | 33 | 34 | 40 | 35 | 39 | 38 |

b) Obtain the rank correlation coefficient for the following data : [ 5M]

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| X | 48 | 60 | 72 | 62 | 56 | 40 | 39 | 52 | 30 |
| Y | 62 | 78 | 65 | 70 | 38 | 54 | 60 | 32 | 31 |

8. a)Ten competitors in a musical test were ranked by the three judges A,B and C in the following order: [ 5M]

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Ranks by A | 1 | 6 | 5 | 10 | 3 | 2 | 4 | 9 | 7 | 8 |
| Ranks by B | 3 | 5 | 8 | 4 | 7 | 10 | 2 | 1 | 6 | 9 |
| Ranks by C | 6 | 4 | 9 | 8 | 1 | 2 | 3 | 10 | 5 | 7 |

Using rank correlation coefficient method , discuss which pair of judges has the nearest approach to

common likings in music.

b) If the two lines of regression are 4X-5Y+30=0 and 20X-9Y-107=0 which of these is the line of

regression of X on Y. Find r and when  [ 5M]

9. a) Obtain the rank correlation coefficient for the following data : [ 5M]

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| X | 68 | 64 | 75 | 50 | 64 | 80 | 75 | 40 | 55 | 64 |
| Y | 62 | 58 | 68 | 45 | 81 | 60 | 68 | 48 | 50 | 70 |

b) Find two regression equations from the following data : [ 5M]

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| X | 10 | 25 | 34 | 42 | 37 | 35 | 36 | 45 |
| Y | 56 | 64 | 63 | 58 | 73 | 75 | 82 | 77 |

1. a) Calculate the correlation coefficient for the following heights(in inches) of fathers(X) and their sons(Y)

[ 6M]

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| X | 65 | 66 | 67 | 67 | 68 | 69 | 70 | 72 |
| Y | 67 | 68 | 65 | 68 | 72 | 72 | 69 | 71 |

b) From the following regression equations, calculate and r 20X-9Y=107, 4X-5Y=-33 [ 4M]

**UNIT –IV**

1. a) write normal equations to [2M]

b) write normal equations to  [2M]

c) Define parameters statistics [2M]

d) Define Null hypothesis, Alternative hypothesis. [2M]

e) If construct 95% confidence interval for population mean . [2M]

1. a)By method of least squares fit a straight line to the following data [5M]

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| X | 1 | 2 | 3 | 4 | 5 |
| y | 14 | 27 | 40 | 55 | 68 |

b) Fit a second degree polynomial to the following data by method of least squares [5M]

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| X | 0 | 1 | 2 | 3 | 4 |
| y | 1 | 1.8 | 1.3 | 2.5 | 6.3 |

1. a) Fit a parabola to the data given below [5M]

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| X | 1 | 2 | 3 | 4 | 5 |
| Y | 10 | 12 | 8 | 10 | 14 |



b) Obtain a relation of the form  for the following data by method of least squares [5M]

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| X | 2 | 3 | 4 | 5 | 6 |
| Y | 8.3 | 15.4 | 33.1 | 65.2 | 127.4 |

1. a) Find the curve of best fit of the type to the following data by method of least squares

[5M]

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| X | 1 | 5 | 7 | 9 | 12 |
| Y | 10 | 15 | 12 | 15 | 21 |

b) Fit a straight line  for the following data [5M]

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| X | 6 | 7 | 7 | 8 | 8 | 8 | 9 | 9 | 10 |
| y | 5 | 5 | 4 | 5 | 4 | 3 | 4 | 3 | 3 |

1. a) Fit a  to the following data, also calculate  [5M]

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| X | 1 | 2 | 4 | 6 |
| y | 6 | 4 | 2 | 2 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| X | 0 | 1 | 2 | 3 | 4 |
| y | 1 | 5 | 10 | 22 | 38 |

b) Fit a second degree polynomial to the following data by method of least squares [5M]

1. a) A sample of 400 items is taken from a population whose standard deviation is 10. The mean of the sample is 40.Test whether the sample has come from a population with mean 38. [5M]

b) The means of two large samples of sizes 1000 and 2000 members are 67.5 inches and 68.0 inches respectively. Can the samples be regarded as drawn from the same population of standard deviation 2.5 inches . [5M]

1. a) It is claimed that a random sample of 49 tyres has a mean life of 15200 km. This sample was

drawn from a population whose mean is 15150kms and standard deviation of 1200 km. Test the

significance at 0.05 level. [5M]

b)Samples of students were drawn from two universities and from their weights in kilograms, mean

and standard deviations are calculated and shown below. Make alarge sample test to test the

significance of the difference between the means. [ 5M]

|  |  |  |  |
| --- | --- | --- | --- |
|  | Mean | S.D | Size of the sample |
| University A | 55 | 10 | 400 |
| University B | 57 | 15 | 100 |

1. a) In a random sample of 125 cool drinkers 68 said they prefer thumsup to pepsi. Test thus null hypothesis against the alternative hypothesis is [5M]

b) On the basis of their total scores, 200 candidates of a civil service examination are divided in to two groups, the upper 30% and the remaining 70%.consider the first question of the examination. Among the first group,40 had correct answer, where as among the second group, 80 had correct answer. On the basis of these results, can one conclude that the first question is not good at discriminating ability of the type being examined here? [5M]

1. a) A die was thrown 9000 times and of these 3220 yielded a 3or 4. Is this consistent with the hypothesis that the die was unbiased? [5M]

b) In two large populations, there are 30%, and 25% respectively of fair haired people. Is this difference likely to be hidden in samples of 1200 and 900 respectively from the two populations .

10. a) A random sample of size 50 has standard deviation 11.8 drawn from a normal population.

can we assume that the sample has been drawn from the population with S.D 10. [5M]

b) Two random samples of sizes 100 each are drawn from two populations with the standard deviations 2.823 and 1.548. Test the significance difference between the sample standard deviations, if the population standard deviation is 2. [5M]

**UNIT-V**

1. a) Define degrees of freedom. [2M]

b) Define Student’s t-test. [2M]

c) Write the formula for Paired t-test. [2M]

d) Write the formula for Student’s t-test for difference of means. [2M]

e) Define Chi-square test. [2M]

2. a) A sample of 26 bulbs gives a mean life of 990 hours with a S.D of 20 hours. The manufacturer

claims that the mean life of bulbs is 1000 hours. Is the sample not up to the standard. [5M]

b)A pair of dice are thrown 360 times and the frequency of each sum is indicated below: [5M]

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Sum | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Frequency | 8 | 24 | 35 | 37 | 44 | 65 | 51 | 42 | 26 | 14 | 14 |

Would you say that the dice are fair on the basis of the chi-square test at 0.05 level of significant?

3. To examine the hypothesis that the husbands are more intelligent than the wives, an investigator

took a sample of 10 couples and administered them a test which measures the I.Q. The results are as

follows: [10M]

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Husbands | 117 | 105 | 97 | 105 | 123 | 109 | 86 | 78 | 103 | 107 |
| Wives | 106 | 98 | 87 | 104 | 116 | 95 | 90 | 69 | 108 | 85 |

Test the hypothesis with a reasonable test at the level of significant of 0.05 and also calculate F-

test.

4. A random sample of 10 boys had the following I.Q’s : 70,120,110,101,88,83,95,98,107 and 100

a) Do these data support the assumption of a population mean I.Q of 100? [10M]

b) Find a reasonable range in which most of the mean I.Q values of samples of 10 boys lie.

5. a) Blood pressure of 5 women before and after intake of a certain drug are given below [5M]

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Before | 110 | 120 | 125 | 132 | 125 |
| After | 120 | 118 | 125 | 136 | 121 |

Test whether the significant change in blood pressure at 1% level of significance.

b. In one sample of 8 observations the sum of the squares of deviations of the sample values from the

sample was 84,4 and in the other samples of 10 observations it was 102.6. Test whether this

difference is significant at 5% level [5M]

6. Two random samples reveal the following results: [10M]

|  |  |  |  |
| --- | --- | --- | --- |
| Sample | Size | Sample Mean | Sum of squares of deviations from the mean |
| 1 | 10 | 15 | 90 |
| 2 | 12 | 14 | 108 |

Test whether the samples came from the same normal population.

7. The nicotine in milligrams of two samples of tobacco were found to be as follows. [10M]

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  | --- |
|  |  |  |  |  |  |  |

Can it be said that the two samples have come from the same normal population.

8. a) A die is thrown 264 times with the following results. Show that the die is biased.

(ѱ2 = 11.07 at 5 d.f & 5% L.S) [5M]

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Number on the die | 1 | 2 | 3 | 4 | 5 | 6 |
| Frequency | 40 | 32 | 28 | 58 | 54 | 52 |

b) Scores obtained in a shooting competition by 10 soldiers before and after intensive training are

given below: [5M]

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Before | 67 | 24 | 57 | 55 | 63 | 54 | 56 | 68 | 33 | 43 |
| After | 70 | 38 | 58 | 58 | 56 | 67 | 68 | 75 | 42 | 38 |

Test whether the intensive training is useful at 0.05 level of significance.

9. a) Find the maximum difference that we can expect with probability 0.95 between the mean of

samples of sizes 10 and 12 from a normal population if their standard deviations are found to be 2

and 3 respectively. [5M]

b) 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 worker (ѱ2 = 3.84 at 1d.f) [5M]

|  |  |  |  |
| --- | --- | --- | --- |
|  | Stable | Unstable | Total |
| Males | 40 | 20 | 60 |
| Females | 10 | 30 | 40 |
| Total | 50 | 50 | 100 |

10.a) Samples of two types of electrical light blubs were tested for length of life and following data

were obtained [5M]

|  |  |  |
| --- | --- | --- |
|  | Type I | Type II |
| Sample numbers | 8 | 7 |
| Sample mean | 1234 hrs | 1036 hrs |
| Sample S.D | 36 hrs | 40 hrs |

Is the difference in the means sufficient to warrant that type I is superior to type II regarding length

of life

b) The number of automobile accidents per week in a certain community are as follows: 12, 8, 20,

2, 14, 10, 15, 6, 9, 4. Are these frequencies in agreement with the belief that accident conditions

were the same during this 10 week period. [5M]