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**Presidency University**

**Bengaluru**

 **SCHOOL OF CSE & IS**

**MAKEUP EXAMINATION JULY- 2024**

**Date**: 08-07-2024

**Time**: 1.30 PM – 4.30 PM

**Max Marks**: 100

**Weightage**: 50%

**Course Code**: CSE5016

**Course Name**: Essentials of Machine learning

**Program & Sem:** MTech 1st Sem

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| **Instructions:***Read the all questions carefully and answer accordingly.* |

**Part A**

**Answer any SIX Questions. Each question carries two marks. (6Qx 5M= 30M)**

1. Explain the formula to find the probability of an event and use the same to find the probability of getting a numbered card when a card is drawn from the pack of 52. (CO:01 BL:02)
2. Discuss briefly Total probability rule and find the probability for the problem stated below: Suppose that in semiconductor manufacturing the probability is 0.10 that a chip that is subjected to high levels of contamination during manufacturing causes a product failure. The probability is 0.005 that a chip that is not subjected to high contamination levels during manufacturing causes a product failure. In a particular production run, 20% of the chips are subject to high levels of contamination. What is the probability that a product using one of these chips fails? (CO:01 BL:02)
3. Explain under which circumstance do we apply Poisson distribution formula to find probability with a suitable example. (CO:02 BL:02)

1. Discuss briefly the Probability mass function, probability density function and Cumulative distribution function. (CO:02 BL:02)
2. Describe any two methods to find Sample space and represent the sample space for the random experiment of “Tossing 2 coins” using the same. (CO:01 BL:02)
3. Differentiate between dependent and independent Multiplication rule and analyze the problem “The probability of finding a red ball from a box of 4 red balls and 3 green balls changes if we take out two balls from the box” to find its probability. (CO:01 BL:02)
4. Explain the difference between Discrete and Continuous Variable and Classify the following into discrete and continuous Variable:
	1. Number of printing mistakes in a book.
	2. Age of a person
	3. Number of road accidents in New Delhi.
	4. Height of a person
	5. Profit earned by the company.
	6. Number of siblings of an individual. (CO:02 BL:02)

1. Identify the relationship between Probability density function and Cumulative distributed function. (CO:02 BL:02)

**Part B [Thought Provoking Questions]**

**Read the Scenario and Answer any FIVE Questions.**

**Each question carries 10 marks. (5Qx10M=50M)**

1. Explain Bayes theorem and apply the same to solve the below :

A doctor is called to see a sick child. The doctor has prior information that 90% of sick children in that neighborhood have the flu, while the other 10% are sick with measles. Let F stand for an event of a child being sick with flu and M stand for an event of a child being sick with measles. Assume for simplicity that F ∪ M = Ω, i.e., that there no other maladies in that neighborhood. A well-known symptom of measles is a rash (the event of having which we denote R). Assume that the probability of having a rash if one has measles is P(R | M) = 0.95.

However, occasionally children with flu also develop rash, and the probability of having a rash if one has flu is P(R | F) = 0.08.

Upon examining the child, the doctor finds a rash. What is the probability that the child has measles?

(CO:01 BL:03)

1. Let X be a random variable and P(X=x) is the probability mass function(PMF) given by

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| X | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| P(X=x) | 0 | K | 2k | 2k | 3k | k2 | 2k2 | 7k2 +k |

1. Find the value of k
2. Find the probability P(X<=6)

 (CO:02 BL:03)

1. Explain the properties of Binomial distribution and apply the same to solve the problem that “80% of people who purchase pet insurance are women.  If 9 pet insurance owners are randomly selected, find the probability that exactly 6 are women”. (CO:02 BL:03)
2. Discuss Quartiles, Deciles and Percentiles with suitable examples.
3. The average score on a test is 80 with a standard deviation of 10. With a new teaching curriculum introduced it is believed that this score will change. On random testing, the score of 38 students, the mean was found to be 88. With a 0.05 significance level, is there any evidence to support this claim?
4. Discuss Student’s t distribution and its significance in Hypothesis testing.

**Part C [Problem Solving Questions]**

## Read the Scenario and Answer any TWO Questions. (2Qx10M=20M)

##  Discuss briefly norms and span of a matrix with suitable example.

## Some researchers show that higher number of flight tickets are bought by males in comparison to females with ratio of 2:1. Out of 150 tickets 88 tickets were bought by males and 62 by females. We need to find out if the experimental manipulation causes the change in the result. Use hypothesis testing to assess the outcome.

1. Find Eigen values and Eigen vectors of A = $\left[\begin{array}{c}0 5 -10\\0 22 16\\0 -9 -2 \end{array}\right]$

## Discuss Chi square distribution and its significance in Hypothesis testing.