IIITS/PS-2023/MID-I

Exam Date: 17-04-2023

Indian Institute of Information Technology Sri City (IIITS)

Name of the Exam: PS_MID - I | Duration: 1.5 hrs | Max. Marks: 20

Instructions:

1. **All questions are mandatory.**
2. **Marks are indicated in [ ] after each question.**
3. **Rough Work should be done separately, not in the answer sheet.**
4. **Answers should be reasoned and derived clearly, not a single word answer.**
5. **Preferably use a ballpoint pen.**
6. **You can use a calculator.**

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1. An integer is chosen at random from 1 to 200. What is the probability that the integer divisible by 6 or 8 ? **[2 M]**

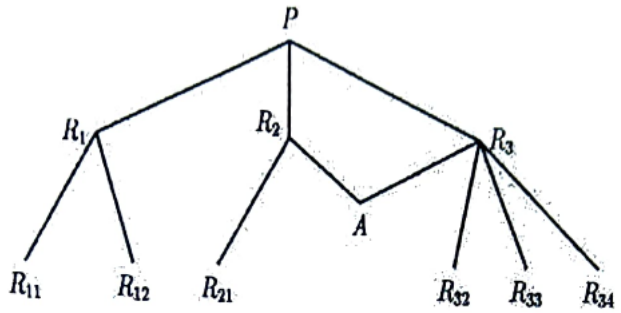
2. It is estimated that 50% of emails are spam emails. Some software has been applied to filter these spam emails before they reach your inbox. A certain brand of software claims that it can detect 99% of spam emails, and the probability for a false positive (a non-spam email detected as spam) is 5%. Now if an email is detected as spam, then what is the probability that it is in fact a non-spam email? **[3 M]**

3. If A, B and C are mutually independent events show that (A ∪ B) and C are also independent. **[2M]**

4. The random variable X has the probability density function f(x)= a $e^{-b|x|}$, $-\infty<x<\infty$ Find the relation between a and b. **[2M]**

5. If a random variable X has a binomial distribution with mean 4 and the variance $\frac{4}{3}$. Find $P(X \geq 1)$. Comment upon the nature of the distribution (skewness and kurtosis). **[3M]**

6. Esow Alben is an Indian bicyclist who leaves a point P (see Figure), choosing one of the roads PR1 , PR2 , PR3 at random. At each subsequent crossroad, he again chooses an available road at random.



What is the probability that he will arrive at point A? **[3 M]**

7. The probability density function of the age of babies, "x" years, being brought to a clinic is given by

$$f(x) = \frac{3}{4}x(2-x) \quad if\ 0 < x < 2$$
$$= 0 \quad otherwise$$

If 60 babies are brought in on a particular day, how many are expected to be under 8 months old? **[3 M]**

8. Suppose the moment generating function of the random variable X is given by

$$M_X(t) = 0.1\,e^{t} + 0.2\,e^{2t} + 0.3\,e^{3t} + 0.4\,e^{4t}.$$

(a). Find the Distribution Function of X. **[1 M]**
(b). Find Var [X]. **[0.5 M]**
(c). Find the Median of X. **[0.5 M]**

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