Questions

National Institute of Technology Rourkela
Department of Mathematics
Mid-Semester Examination-2019-2020

Sub. Code: MA 2203 Sub. Name: Intro. to Prob. & Stat. Dept. Code: MA
No of pages: 1 Full Marks: 30 Duration: 2 Hours

- Answer all questions.
- All parts of a question should be answered at one place.

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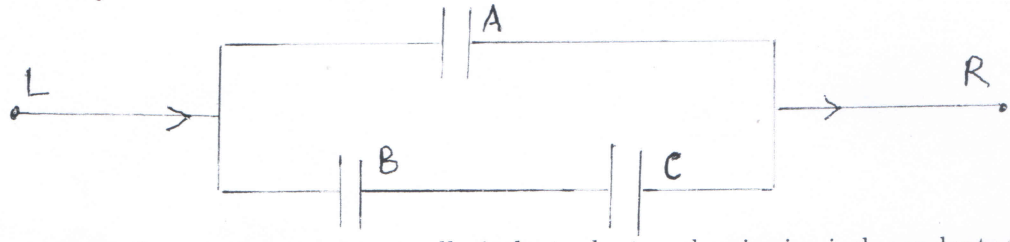
1. A bag contains 5 white and 2 black balls and balls are drawn one by one with replacement. What is the probability of drawing the second white ball before the second black ball? [3]

2. In the following figure, assume that the probability of a relay being closed is 1/3 and that a relay is open or closed independently of any other. Find the probability that current flows from L to R. [3]



3. State the difference between mutually independent and pairwise independent events. Let A and B be two independent events. Prove that A^c and B^c are also independent. [3]

4. A new manufacturer produces LED bulbs and packs them in boxes of n each. The probability of a bulb being defective is p. Let X be the number of defective bulbs in a box. Find the skewness of X. [3]

5. A packet contains two types of resistors, 30 resistors of resistance 47Ω and 20 resistors of resistance 56Ω. Let X be the numbers of 47Ω resistors out of 10 resistors drawn from the packet at random WITHOUT REPLACEMENT. Find the mean and variance of X. [3]

6. Derive the moment generating function of a standardized normal random variable. Further obtain the central moments of all order. [3]

7. A distributor of bean seeds determine from extensive tests that 5% of a large batch of seeds will not germinate. He seeds in packets of 200 and guarantees 90% germination. Determine the probability that a particular packet will violate the guarantee. (Use Poisson approximation) [3]

8. Two dice are thrown simultaneously. Let X be the maximum of the numbers that the two dices shows. Is this X a random variable if yes find the cumulative distribution function of X. [3]

9. A continuous random variable X has a probability density function, [3]

$$f(x) = \begin{cases} 3x^2, & 0 \le x \le 1, \\ 0, & \text{otherwise.} \end{cases}$$

Find a and b such that (i) $P(X \le a) = P(X > a)$ and (ii) $P(X > b) = 0 \cdot 05$.

10. The weights of 300 students are normally distributed with mean 68kgs and standard deviation 3kgs. What percentage of students have weight (i) greater than 72kgs (ii) less than 64kgs and (iii) between 65kgs and 71kgs. [3]

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