DEPARTMENT OF INFORMATION TECHNOLOGY, NITK SURATHKAL

MID SEMESTER EXAMINATION, SEPTEMBER 2023

IT302: PROBABILITY AND STATISTICS

Class: V SEM B.TECH (IT)
Date: 27/09/2023

Time: 1½ Hrs.
Marks: 20

Register No. | 2 | 1 | 1 | 0 | 5 | 0 | 1 |

NOTE: 1. Answer all questions

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1. A sentiment analysis algorithm is used to determine whether social media posts are positive or negative. When a post is positive, the algorithm correctly classifies it as such 85% of the time, and when a post is negative, it correctly classifies it as negative 90% of the time. **(3M)**
   - a) If the algorithm categorizes a post as positive, what is the probability that the post is actually positive?
   - b) If the algorithm categorizes a post as negative, what is the probability that the post is truly negative?
2. A coin is tossed n times. At each toss, the coin comes up a head with probability p, and a tail with probability 1-p. Let X be a random variable that represents the number of heads in the n-toss sequence. Find the mean and variance of X. **(3M)**
3. Romeo and Juliet have a date at a given time, and each will arrive at the meeting place with a delay between 0 and 1 hour, with all pairs of delays being equally likely. The first to arrive will wait for 7 minutes and will leave if the other has not yet arrived. What is the probability that they will meet? **(2M)**
4. Answer the following related to the statistical distributions **(9M)**
   - a) Explain the nature of any six pdfs on changing their respective parameters. (3M)
   - b) Give two examples for each one where the above pdfs find applications. Validate your examples with appropriate reasoning. (6M)
5. Compute the following using standard normal table **(3M)**
   - a) p(-0.45<=z<=2.15) when 1 < mean <= 1.5 and 2 < variance <= 2.5 (assume integral multiples of 0.25 for both the mean and variance)
   - b) p(-1.65<=z<=2.15) when -2.5 <= mean < -2 and 0.5 <= variance < 1 (assume integral multiples of 0.25 for both the mean and variance).

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