Ramakrishna Mission Vivekananda Educational and Research Institute
(Deemed to be University under Sec. 3 of the UGC Act 1956)
PO Belur Math, Howrah, West Bengal 711202

Department of Computer Science

CS111/DA104: Probability
Assignment 2

Batch: MSc CS/BDA 2019-21 *Due Date: 15.07.2019*
Semester: Jul-Dec 2019 *Maximum Marks: 20*

Assignments are due at 10:00 am on due date

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1. Arijit, Bikramjit and Jasjit are flipping a coin in turns (A-B-J-A-B etc.), and the first one to get heads will win. The coin is biased and has an *odds ratio* of 1/4 of falling heads. The Sample Space is $S = \{H, TH, TTH, TTTH, \cdots, TTT\cdots TH, \cdots\}$.

   (a) If event J corresponds to Jasjit's victory, write down the subset of the sample space corresponding to this event. Do the same for event A. (1)

   (b) What are the probabilities of events A, J and S? (2)

2. In a country, 97% of delivery cases result in survival of the baby. Among the cases where delivery is through C-section (Caesarian), 95% of cases result in survival. It is known that 20% of deliveries in that country are C-sections. If a woman chooses a normal (non C-section) delivery, what is the probability of survival of her baby? (1)

3. A parallel connection of n bulbs gives light if at least one of the n bulbs is working. Suppose each bulb has a 0.6 probability of being damaged. Given that the parallel connection is working, what is the probability that the first bulb is damaged? (2)

4. A university has 30 Physics, 20 Mathematics and 50 CS/BDA students. The fractions of students pursuing PhD in the three departments is 0.2, 0.3 and 0.1 respectively. Given a randomly selected student is not a PhD student, what is the probability that the student is from the CS/BDA group? (1)

5. A masters student in a CS department has to pass three semesters before reaching the final semester which is devoted to project work. The probability of passing the first semester and going on to the second is 0.95, and for a student who has reached the second semester, probability of passing on to the third is 0.90. For a student who has successfully reached the third semester, the probability of passing on to the project semester is 0.85. Calculate the probability of the following events

   (a) The student passes all three semesters (1)

   (b) Given the student did not reach the project stage, he failed the second semester. (2)

6. A person is carrying two coins, one fair and one with two heads. He randomly selects a coin and flips it. Compute is the probability that it is the fair coin given the following:

   (a) The first flip gives heads. (1)

(b) The first and second flips give heads. (1)

(c) The third flip gives a tail. (1)

7. A and B are engaged in a shooting match. In each round A has a 0.7 probability of hitting her target, and B has 0.6 probability of hitting his. If neither hits target, the game continues to next round. Otherwise, either the first hitter wins or else the game ends in a draw (if both hit). Calculate probability of the following events

(a) A wins the game. (1)

(b) The game ends in a draw. (1)

(c) The game ends after exactly 5 rounds. (1)

(d) Given A wins, probability that game ends after exactly 6 rounds. (2)

(e) Given game is a draw, probability that game ends after exactly 7 rounds. (2)