Minia University - Faculty of Science
Department of Mathematics
Final Summer Term Exam 2020/2021
Course: Probability and Statistics

Time: 2 hours
Date: Sep 2021
Code: MATH103

Answer the following questions

Question # 1:

Choose the correct answer with the explanation:

1. If $A \subset B$, Then P(B|A)=

   a) P(A|B) b) P(A) c) P(B) d) None of them

2. If the knowledge that an event A has occurred implies that a second event B cannot occur, the events A and B are said to be

   a) Independent b) Mutually exclusive c) $A \subset B$ d) $B \subset A$

3. If A and B be independent events in a sample space S, then which of the following statement(s) are true

   a) A and B^c are independent b) B and A^c are independent

   c) A^c and B^c are independent d) All of preceding

4. A code consists of a digit chosen from 0 to 7 followed by a letter of the alphabet.

   What is the probability the code is 7Z?

   a) $\frac{1}{260}$ b) $\frac{1}{156}$ c) $\frac{1}{208}$ d) None of them

5. For a continuous random variable X with a probability density function

   $f(x) = \begin{cases} k\,(x^2+1), & 0 \le x \le 1 \\ 0, & o.w. \end{cases}$, then the value of k is

   a) $\frac{1}{2}$ b) $\frac{3}{4}$ c) $\frac{1}{3}$ d) $\frac{4}{5}$

6. The value of k when the probability mass function is given by,

   $P(x) = \begin{cases} \frac{x}{k}, & x = 1,2,3 \\ 0, & o.w \end{cases}$ is

   a) 9 b) 6 c) $\frac{1}{9}$ d) $\frac{1}{6}$

7. The cumulative distribution function for the random variable X for

   $f(x) = \begin{cases} 2x, & 0 \le x < 1 \\ 0, & o.w. \end{cases}$ is given by

   a) $1-x$ b) $x-1$ c) x^2 d) None of them

8. If $f(x) = \begin{cases} 2\,e^{-2x}, & 0 \le x < \infty \\ 0, & o.w. \end{cases}$, then the value of x such that $p(X > x) = 0.1$ is

   a) 1.15 b) 2.3 c) -2.3 d) None of them

9. If the variance of x $v(x) = 2$, then $v\left(\frac{x}{2} - 5\right) =$

   a) $\frac{1}{2}$ b) 2 c) 4 d) $\frac{1}{4}$

10. $E(a\,x + b)$=

a) $a^2\,E(x + b)$ b) $aE(x)$ c) $aE(x) + b$ d) None of them

Question # 2:

In a certain assembly plant, three machines, B_1, B_2 and B_3, make 30%, 45%, and 25%, respectively, of the products. It is known from past experience that 2%, 3%, and 2% of the products made by each machine, respectively, are defective. Now, suppose that a finished product is randomly selected.

a) What is the probability that it is defective?

b) If a product was chosen randomly and found to be defective, what is the probability that it was made by machine B_3?

Question # 3:

1. When Mahmoud plays chess against his favorite computer program, he wins with probability 0.60.

   a) What is the probability that Mahmoud wins 6 games, if he plays 10 games?

   b) What is the probability that Mahmoud wins 2 games at most, if he plays 10 games?

2. Fares makes mistakes in class according to Poisson process with an average rate of 1.2 mistakes per class.

   a) What is the probability that Fares makes 2 mistakes during one class?

   b) What is the probability that Fares makes one mistake at least during one class?

Question # 4:

An introductory biology student wishes to determine the relationship between temperature and heart rate in the common leopard frog, *Rana pipiens*. He manipulates the temperature in 2° increments ranging from 2 to 18°C and records the heart rate (beats per minute) at each interval. His data are presented below.

Temperature (°Celsius) X	2	4	6	8	10	12	14	16	18
Heart rate (bpm) Y	5	11	11	14	22	23	32	29	32

a) Find the best line equation (simple linear regression equation) so that Y may be predicted from X.

b) Predict the heart rate in the common leopard frog when the temperature is 20°.

c) Compute the correlation coefficient r.

Best wishes and wish Good Luck. Dr. Hossam Radwan