December 26, 2014

IŞIK UNIVERSITY, MATH 230 FINAL EXAM

Q1 |	Q2 |	Student ID:	Row No:
Q3 |	Q4 |		
Last Name:		First Name:	

1. (10 points)

   i. State 4 different types of **discrete random variables** that you learned in this class.

      1. ....

      2. ....

      3. ....

      4. ....

   ii. State 3 different types of **continuous random variables** that you learned in this class.

      1. ....

      2. ....

      3. ....

   iii. State the main difference between discrete and continuous random variables.

2. (12 points)

    i. How many permutations are there of the word "MATHEMATICS"?

    ii. A ternary string is a word consisting of only 0, 1 or 2. (*For example, 0102 is a ternary string of length 4.*) How many ternary strings of length 4 have at least 2 ones?

    iii. In how many ways can 5 people be seated to 7 chairs?

Student's Name : ________________

3. (14 points) There is a game which is played with a coin and two different types of dice. The coin is biased and hence the probability of HEADS is 0.4 whereas the probability of TAILS is 0.6. The first dice is a fair **4-faced** dice and the faces are numbered as 1,2,3,4. The second dice is a fair **6-faced** dice and the faces are numbered as 1,2,3,4,5,6.
   First of all, the coin is flipped. If the coin shows HEADS then the **4-faced** dice is rolled. If the coin shows TAILS, then the **6-faced** dice is rolled.

   i. What is the probability that the rolled dice shows a 3?

   ii. If the rolled dice shows a 3, what is the probability that the coin shows HEADS?

4. (12 points) During winter season, there is a probability of 0.2 of having a day with decent weather (temperature above 15 degrees). If we consider that the winter season has 90 days,

    i. what is the exact probability that there will be at most 2 decent days this winter season?

    ii. What is the approximate probability that there will be at most 2 decent days this winter season if you use Poisson distribution.

Q5 |	**Q6** |	**Student ID:**	**Row No:**
Q7 |	**Q8** |		
Last Name:		**First Name:**	

5. (16 points) Random variables X and Y have the joint PMF

$$p_{X,Y}(x,y) = \begin{cases} c|x+y| & \text{if } x = -2, 0, 2 \text{ and } y = -1, 0, 1 \\ 0 & \text{otherwise.} \end{cases}$$

i. Find c

ii. What is the probability $\mathbb{P}(Y > X)$?

6. (12 points) 4) Given the following joint PDF:

$$f_{X,Y}(x,y) = \begin{cases} k & \text{if } 0 < x < y < 1 \\ 0 & \text{otherwise.} \end{cases}$$

i. Find the value of k.

ii. Determine the conditional pdf $f_{X|Y}(x|y)$

iii. Determine the conditional pdf $f_{Y|X}(y|x)$

Student's Name : ____________________

7. (12 points) The peak temperature T, in degrees Fahrenheit, on a July day in Antarctica is a Gaussian random variable with a variance of 225. With probability 1/2, the temperature T exceeds 10 degrees.

   i. What is $\mathbb{P}(T > 32)$, the probability the temperature is above freezing?

   ii. What is $\mathbb{P}(T < 0)$?

   iii. What is $\mathbb{P}(T > 60)$?

8. (12 points) If the PDF of a continuous random variable X is given as

$$f(x) = \begin{cases} (1/2)e^{-x/2} & \text{if } x \geq 0 \\ 0 & \text{otherwise.} \end{cases}$$

i. Find the probability $\mathbb{P}(1 \leq X \leq 2)$.

ii. What is its CDF (cumulative distribution function)?