THE SOUTHERN UNIVERSITY OF SCIENCE AND TECHNOLOGY
DEPARTMENT OF MATHEMATICS

MA215 Probability Theory

Exercise Sheet 10

Set: Monday 23rd November; Hand in: Wednesday 30th November by 5pm.

1. Suppose a player plays the following gambling games which is known as the wheel of fortune. The player bets on one of the numbers 1 through 6. Three dice are then rolled, and if the number bet by the player appears i times, $i = 1, 2, 3$, then the player wins i units; on the other hand, if the number bet by the player does not appear on any of the dies, then the player loses 1 unit. Is this game fair to the player?

2. The two discrete random variables X and Y have joint probability mass function given by

	$Y=1$	$Y=2$	$Y=3$	$Y=4$
$X=1$	2/32	3/32	4/32	5/32
$X=2$	3/32	4/32	5/32	6/32

   Obtain $E[X]$ and $E[Y]$.

3. Suppose the random variable X takes non-negative integer values only. Show that

$$E(X) = \sum_{n=0}^{\infty} P(X > n) = \sum_{n=1}^{\infty} P(X \geq n).$$

4. Suppose the random variable X obeys the uniformly distribution over interval $[a, b]$. Find $E(X)$.

5. Suppose the random variable X obeys the general gamma distribution with parameters λ and α where $\lambda > 0$ and $\alpha > 0$. Write down the pdf of this general gamma random variable and the analytic form of the gamma function $\Gamma(\alpha)$ for $\alpha > 0$ and hence find the $E(X)$ of this general gamma random variable.

6. Suppose $Y = X^2$ where X is normally distributed with parameters μ and σ^2. Obtain the pdf of Y and then find $E(Y)$.

7. The two continuous random variables X and Y have joint pdf

$$f(x, y) \quad = \quad x + y \qquad (0 \leq x \leq 1,\ 0 \leq y \leq 1)$$

   Find $E[X]$ and $E[Y]$.