一. 选择题

1. Suppose that A,B are two events, and $P(AB) = 0$, then

   A. AB is a null event

   B. A and B are mutually exclusive

   C. P(A)=0 or P(B) =0

   D. AB may not be a null event

2. X_1, X_2 are two random variables with distribution functions $F_1(x), F_2(x)$ respectively. If $aF_1(x) + bF_2(x)$ is also a distribution for a random variable. Then a, b could be

   A. $a = 3/5, b = -1/2$

   B. $a = -1/2, b = 3/2$

   C. $a = 1, b = -1$

   D $a = 1/2, b = 2/3$

3. $Z = max[X, Y]$. Then $F_z(Z)$ equals?

   A. $max[F_X, F_Y]$

   B. F_x

   C. $F_X + F_Y$

   D $F_X F_Y$

4. $Var[X] = 4, Var[Y] = 9$. The correlation coefficient is 0.5. find the $Var[2X - Y]$

5. $E[XY] = E[X]E[Y]$, then

二. 填空题

1. 2 red balls, 5 blue balls in the urn. The probability of the second ball is blue is ?
2. $P(x) = ax + b, x \in [1, 3]$ And $P[2 < x < 3] = 2P[1 < x < 2]$ find a and b
3. X, Y are independent Poisson random variables $E[x] = 2, D[y] = 4$. Then $P[X + Y = 3]$?
4. $X \sim N(0, 4)$ $Y = -2X + 1$ Then $Y \sim$?
5. K uniformly distribute on $[0, 4]$. find Probability that equation $4x^2 + 4Kx + K + 2$ has real root.
6. Let X and Y 's joint probability density function is $f(x, y) = 8xy, 0 < x < y < 1$ then $P[X + Y > 1] =$?

三. 计算题

1. Jack Mike Tom want to eat the last piece of cake. The probability that Jack want is 0.4 , Mike want is 0.35, Tom want is 0.25. Find the probability that only one of them want to eat the cake.

2. X is uniformly distributed on $[-1, 1]$

   (a) find $E[2X]$ and $D[2X]$

   (b) find the probability density function of $Y = |X|$

3. Tossing n fair coins X is the number of head and Y is the number of tail

   (a) find the probability mass function of X

(b) Prove the correlation coefficient of $X+Y$ and $X-Y$ is 0

4. $f(x,y)=Ae^{-3x-2y}, x>0, y>0$

   (a) find A

   (b) find $P[X+Y<3]$

   (c) find the probability density function of X

   (d) Does X and Y independent. Why or Why not

5.

(X,Y)	(0,1)	(0,2)	(1,1)	(1,2)
P	1/8	3/8	1/4	1/4

   (a) find the probability mass function of $Z=X+Y$

   (b) find $E[X]$.