ASSIGNMENT-6

Question-1).

```
# Q1
func1 <- function(x, y) 2*(2*x + 3*y)/5

# (i) Check that it is a joint density function or not?
I <- integral2(func1, 0, 1, 0, 1)
print(I$Q)
if(I$Q == 1){
  print("As value of integral is equal to 1, therefore it is a joint density function")
} else {
  print("As value of integral is not equal to 1, therefore it is not a joint density function")
}

# (ii) Find marginal distribution g(x) at x = 1.
gfunc1_x <- function(y) func1(1, y)
I_mdofxequal1 <- integral(gfunc1_x, 0, 1)
print(I_mdofxequal1)

# (iii)  Find the marginal distribution h(y) at y = 0.
gfunc1_y <- function(x) func1(x, 0)
I_mdofyequal0 <- integral(gfunc1_y, 0, 1)
print(I_mdofyequal0)

# (iv)  Find the expected value of g(x, y) = xy.
gfunc1_xy <- function(x, y) x*y*2*(2*x + 3*y)/5
I_mdofxy <- integral2(gfunc1_xy, 0, 1, 0, 1)
print(I_mdofxy$Q)
```

```
> # Q1
> func1 <- function(x, y) 2*(2*x + 3*y)/5
>
> # (i) Check that it is a joint density function or not?
> I <- integral2(func1, 0, 1, 0, 1)
> print(I$Q)
[1] 1
> if(I$Q == 1){
+   print("As value of integral is equal to 1, therefore it is a joint density function")
+ } else {
+   print("As value of integral is not equal to 1, therefore it is not a joint density function")
+ }
[1] "As value of integral is not equal to 1, therefore it is not a joint density function"
>
> # (ii) Find marginal distribution g(x) at x = 1.
> gfunc1_x <- function(y) func1(1, y)
> I_mdofxequal1 <- integral(gfunc1_x, 0, 1)
> print(I_mdofxequal1)
[1] 1.4
>
> # (iii)  Find the marginal distribution h(y) at y = 0.
> gfunc1_y <- function(x) func1(x, 0)
> I_mdofyequal0 <- integral(gfunc1_y, 0, 1)
> print(I_mdofyequal0)
[1] 0.4
>
> # (iv)  Find the expected value of g(x, y) = xy.
> gfunc1_xy <- function(x, y) x*y*2*(2*x + 3*y)/5
> I_mdofxy <- integral2(gfunc1_xy, 0, 1, 0, 1)
> print(I_mdofxy$Q)
[1] 0.3333333
>
```

Question-2).

```
#2
#i,ii
f<-function(x,y){
  return ((x+y)/30)
}
m<-matrix(c(f(0,0:2),f(1,0:2),f(2,0:2),f(3,0:2)),nrow=4,ncol=3,byrow=TRUE)
print(m)
if (sum(m)==1){
  print ("It is a PMF")
}

#iii,iv
g<-apply(m,1,sum)
g
h<-apply(m,2,sum)
h

#v
m[1,2]/h[2]

#vi
x<-c(0:3)
EX<-sum(x*g)
print(EX)
EX_square<-sum(x*x*g)
print(EX_square)
VarX=EX_square-(EX)*EX
print(VarX)
y<-c(0:2)
EY<-sum(y*h)
print(EY)
EY_square<-sum(y*y*h)
print(EY_square)
VarY=EY_square-(EY)*EY
print(VarY)
fun2<-function(x,y){
  x*y*(x+y)/30
}
mat2<-matrix(c(fun2(0,0:2),fun2(1,0:2),fun2(2,0:2),fun2(3,0:2)),nrow=4,ncol=3,byrow=TRUE)
eXY<-sum(mat2)
covariance<-eXY-EX*EY
print(covariance)
correlation<-covariance/(sqrt(VarX*VarY))
print(correlation)
```

```
> f<-function(x,y){
+   return ((x+y)/30)
+ }
> m<-matrix(c(f(0,0:2),f(1,0:2),f(2,0:2),f(3,0:2)),nrow=4,ncol=3,byrow=TRUE)
> print(m)
           [,1]       [,2]       [,3]
[1,] 0.00000000 0.03333333 0.06666667
[2,] 0.03333333 0.06666667 0.10000000
[3,] 0.06666667 0.10000000 0.13333333
[4,] 0.10000000 0.13333333 0.16666667
> if (sum(m)==1){
+   print ("It is a PMF")
+ }
[1] "It is a PMF"
>
> #iii,iv
> g<-apply(m,1,sum)
> g
[1] 0.1 0.2 0.3 0.4
> h<-apply(m,2,sum)
> h
[1] 0.2000000 0.3333333 0.4666667
>
> #v
> m[1,2]/h[2]
[1] 0.1
>
> #vi
> x<-c(0:3)
> EX<-sum(x*g)
> print(EX)
[1] 2
> EX_square<-sum(x*x*g)
> print(EX_square)
[1] 5
> VarX=EX_square-(EX)*EX
> print(VarX)
[1] 1
> y<-c(0:2)
> EY<-sum(y*h)
> print(EY)
[1] 1.266667
> EY_square<-sum(y*y*h)
> print(EY_square)
[1] 2.2
> VarY=EY_square-(EY)*EY
> print(VarY)
[1] 0.5955556
> fun2<-function(x,y){
+   x*y*(x+y)/30
+ }
> mat2<-matrix(c(fun2(0,0:2),fun2(1,0:2),fun2(2,0:2),fun2(3,0:2)),nrow=4,ncol=3,byrow=TRUE)
> eXY<-sum(mat2)
> covariance<-eXY-EX*EY
> print(covariance)
[1] -0.1333333
> correlation<-covariance/(sqrt(VarX*VarY))
> print(correlation)
[1] -0.1727737
>
```