



## Islamic University of Technology

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**Section :** A- 2

**Department :** Electrical & Electronic Engineering

**Course No :** EEE 4408

**Course Name :** Random Signals & Processes Lab

**Experiment No :** 02

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### Classroom Task-01:

```
M=6; % can be changed
```

```
M = 7  
R = 3
```

```
sample_space=combvec(1:M,1:M,1:M)'
```

```
sample_space = 343x3  
1     1     1  
2     1     1  
3     1     1  
4     1     1  
5     1     1  
6     1     1  
7     1     1  
1     2     1  
2     2     1  
3     2     1  
⋮  
⋮  
⋮
```

```
pmf=zeros(1,4);  
for x=0:3  
    count=0;  
    for i=1:size(sample_space,1)  
        red_count=nnz(sample_space(i,:)==1);  
        if red_count==x  
            count=count+1;  
        end  
    end  
end
```

```

end
pmf(x+1)=count/size(sample_space,1);
end
pmf

```

```

pmf = 1x4
    0.6297    0.3149    0.0525    0.0029

```

### Classroom Task-02:(Alternative)

```

N=input('No. of bulbs N = ')
M=input('No. of colors M = ')
p_red=1/M;
x1=0:N;
pmf=binopdf(x1,N,p_red)

```

```

pmf = 1x4
    0.5787    0.3472    0.0694    0.0046

```

### Example-1.18

```

[X1,X2]=ndgrid(1:4,1:4);
all_samples=[X1(:),X2(:)];
Size=size(all_samples,1);
A=all_samples(all_samples(:,1)>=2,:);
B=all_samples(all_samples(:,2)>all_samples(:,1),:);
P_A=size(A,1)/Size;
P_B=size(B,1)/Size;
AB=all_samples(all_samples(:, 1)>=2 & all_samples(:, 2)>all_samples(:, 1), :);
P_AB=size(AB,1)/Size;
P_A_given_B=P_AB/P_B;
all_samples

```

```

all_samples = 16x2
     1     1
     2     1
     3     1
     4     1
     1     2
     2     2
     3     2
     4     2
     1     3
     2     3
     ⋮

```

P\_A

```
P_A = 0.7500
```

P\_B

```
P_B = 0.3750
```

P\_A\_given\_B

P\_A\_given\_B = 0.5000

Example-1.19:

```
P_B1=3000/(3000+4000+3000);
P_B2=4000/(3000+4000+3000);
P_B3=3000/(3000+4000+3000);
P_A_given_B1=0.8;
P_A_given_B2=0.9;
P_A_given_B3=0.6;
P_A=(P_A_given_B1*P_B1)+(P_A_given_B2*P_B2)+(P_A_given_B3*P_B3)
```

P\_A = 0.7800

Example-1.22:

```
P_M_fail=0.05;
P_E_fail=0.20;
P_M_accept=1-P_M_fail;
P_E_accept=1-P_E_fail;
P_ma_ea=P_M_accept*P_E_accept;
P_ma_er=P_M_accept*P_E_fail;
P_mr_ea=P_M_fail*P_E_accept;
P_mr_er=P_M_fail*P_E_fail;
total_probability=P_ma_ea+P_ma_er+P_mr_ea+P_mr_er;
P_ma_ea
```

P\_ma\_ea = 0.7600

P\_ma\_er

P\_ma\_er = 0.1900

P\_mr\_ea

P\_mr\_ea = 0.0400

P\_mr\_er

P\_mr\_er = 0.0100

total\_probability

total\_probability = 1

Example-1.27:

```
P_C1=0.5;
P_C2=0.5;
P_H_given_C1=3/4;
```

```

P_T_given_C1=1/4;
P_H_given_C2=1/2;
P_T_given_C2=1/2;
P_H=(P_H_given_C1*P_C1)+(P_H_given_C2*P_C2);
P_T=(P_T_given_C1*P_C1)+(P_T_given_C2*P_C2);
P_C1_given_H=(P_H_given_C1*P_C1)/P_H;
P_C1_given_T=(P_T_given_C1*P_C1)/P_T;
P_H

```

```
P_H = 0.6250
```

```
P_T
```

```
P_T = 0.3750
```

```
P_C1_given_H
```

```
P_C1_given_H = 0.6000
```

```
P_C1_given_T
```

```
P_C1_given_T = 0.3333
```

Example-1.37:

```

m=4;
n=10;
grd=["S0","S1","S2","S3"];
total_sequences=m^n

```

```
total_sequences = 1048576
```

```
observe_seq=grd(randi(m,1,n))
```

```

observe_seq = 1x10 string
"S2"        "S0"        "S3"        "S3"        "S2"        "S3"        "S ..."

```

Example 1.41:

```

q=0.1;
p=1-q;
pE=(nchoosek(5,0)*q^5)+(nchoosek(5,1)*p*q^4)+(nchoosek(5,2)*p^2*q^3)

```

```
pE = 0.0086
```

Example 2.5:

```

a=dec2bin(0:7);
t=replace(a(:)', {'0','1'}, {'d','v'});
out=cellstr(reshape(t,8,3));
X=[0 1 1 2 1 2 2 3];
Y=[3 2 2 1 2 1 1 0];

```

```
R=X.*Y;
S=[cellstr(out) num2cell(X') num2cell(Y')]
```

```
S = 8x3 cell
```

	1	2	3
1	'ddd'	0	3
2	'ddv'	1	2
3	'dvd'	1	2
4	'dvv'	2	1
5	'vdd'	1	2
6	'vdv'	2	1
7	'vvd'	2	1
8	'vvv'	3	0

Example-2.7:

```
S={'gg','gb','bg','bb'}
```

```
S = 1x4 cell
```

```
'gg'      'gb'      'bg'      'bb'
```

```
PMFX=[1/numel(S) (2*1)/numel(S) 1/numel(S)];
```

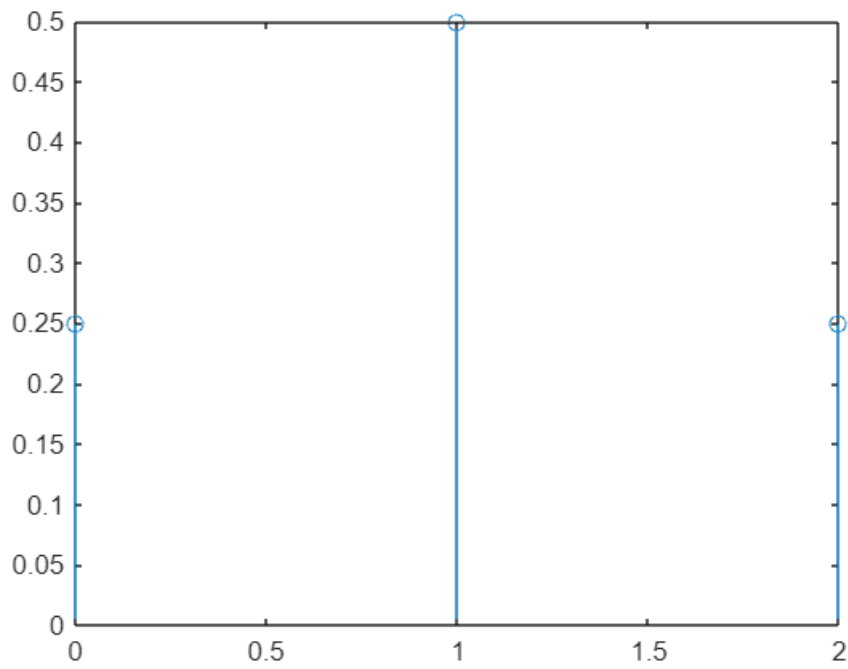
```
x=[0 1 2];
```

```
PMFX
```

```
PMFX = 1x3
```

```
0.2500    0.5000    0.2500
```

```
stem(x,PMFX)
```

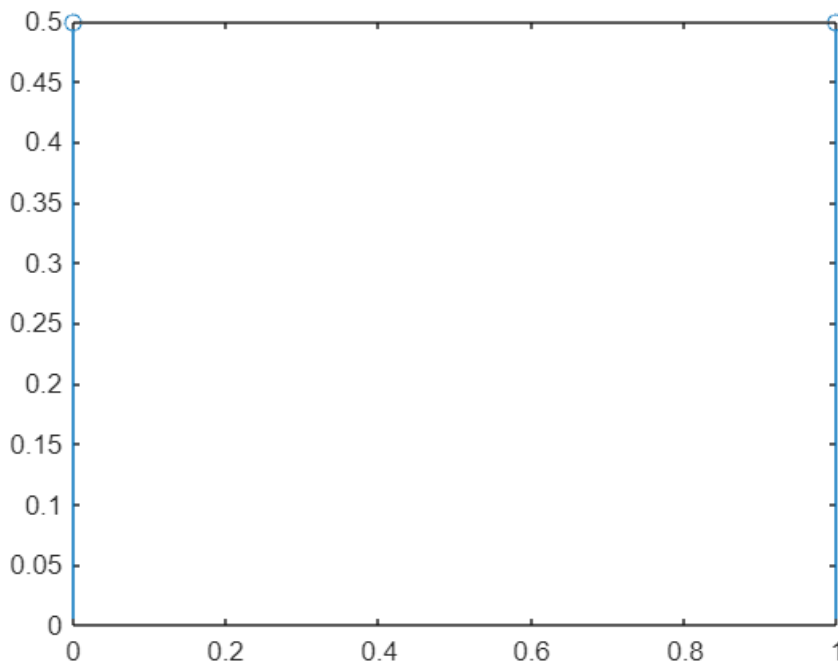


Example 2.8:

```
PMFX=[0.5 0.5]
```

```
PMFX = 1x2  
0.5000 0.5000
```

```
x=[0 1];  
stem(x,PMFX)
```



```
x1=5;
if ismember(x1,x)
    p=PMFX(x1+1)
else
    p=0
end
```

p = 0

Example 2.11:

```
Y=input('Value of Y: ')
```

Y = 8

```
p=0.4;
if (Y<0) PY = 0
else
    PY = p*(1-p)^(Y-1)
end
```

PY = 0.0112

Example 2.19:

```
lambda=2*0.25;
h=0;
Pho=(lambda^h)*exp((-lambda)/factorial(h))
```

Pho = 0.6065

```
lambda=2*1;  
Ph2=0;  
for i=0:2  
    Ph=(lambda^i)*exp(-lambda)/factorial(i);  
    Ph2=Ph2+Ph;  
end  
Ph2
```

Ph2 = 0.6767

Example 2.31:

```
EY=0;  
for i=1:4  
    EY=EY+(1/4)*(10.5*i - 0.5*i^2);  
end  
EY
```

EY = 22.5000