AMRITA VISHWA VIDYAPEETHAM

DIGITAL COMMUNICATION LAB

Name: INDUKURI GOWTHAM KISHORE **Roll No: AM.EN.U4ECE18504**

Aim:

1. To obtain the set of orthogonal basis vectors.

Lab Exercises

1. Use Mat lab to find and plot the orthogonal basis for the waveforms of Signal Set

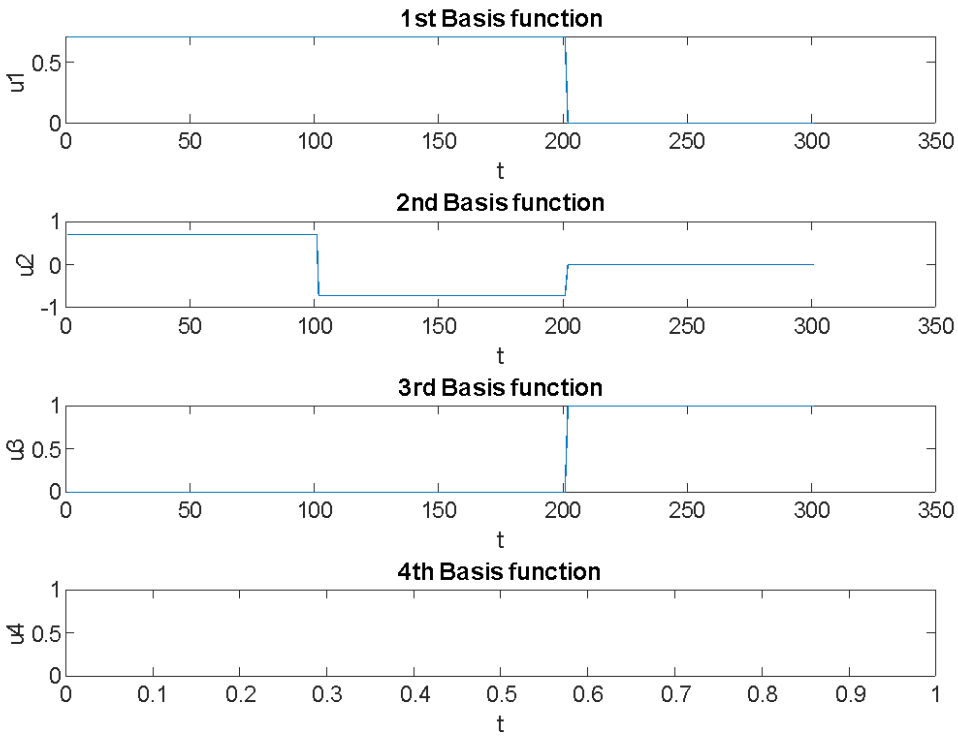
Sol:

Signal Set1:

Matlab code :

```
t=0:0.01:3;
a=[ones(1,length(0:0.01:2)),zeros(1,length(2.01:0.01:3))];
b=[ones(1,length(0:0.01:1)),-1.*ones(1,length(1.01:0.01:2)),zeros(1,length(2.01
:0.01:3))];
c=ones(1,length(0:0.01:3));
d=[ones(1,length(0:0.01:1)),-1.*ones(1,length(1.01:0.01:3))];
dt=0.01;
ea=sum(a.*a.*dt);
u1=a./(sqrt(ea));
subplot(4,1,1)
plot(u1)
c21=sum(b.*u1*dt);
d2=b-(c21.*u1);
ed2=sum(d2.*d2*dt);
u2=d2./(sqrt(ed2));
subplot(4,1,2)
plot(u2)
c31=sum(c.*u1*dt);
c32=sum(c.*u2*dt);
d3=c-((c31.*u1)+(c32.*u2));
ed3=sum(d3.*d3*dt);
u3=d3./(sqrt(ed3));
subplot(4,1,3)
plot(u3)
c41=sum(d.*u1*dt);
c42=sum(d.*u2*dt);
c43=sum(d.*u3*dt);
d4=d-round(((c41.*u1)+(c42.*u2)+(c43.*u3)));
ed4=sum(d4.*d4*dt);
u4=d4./(sqrt(ed4));
subplot(4,1,4)
plot(u4)
```

Plot:



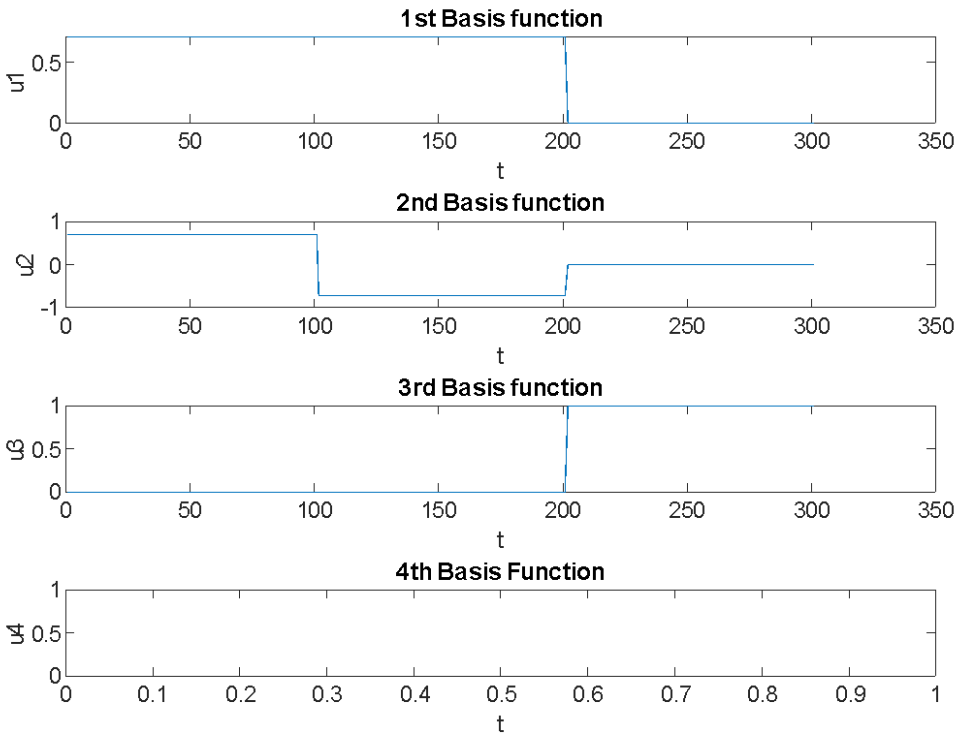
Signal Set 2 :

Matlab Code :

```
t=0:0.01:3;
a=[ones(1,length(0:0.01:2)),zeros(1,length(2.01:0.01:3))];
b=[ones(1,length(0:0.01:1)),-1.*ones(1,length(1.01:0.01:2)),zeros(1,length(2.01
:0.01:3))];
c=[-1.*ones(1,length(0:0.01:1)),ones(1,length(1.01:0.01:3))];
d=(ones(1,length(0:0.01:3)));
dt=0.01;
ea=sum(a.*a.*dt);
u1=a./(sqrt(ea));
subplot(4,1,1)
plot(u1)
c21=sum(b.*u1*dt);
d2=b-(c21.*u1);
ed2=sum(d2.*d2.*dt);
u2=d2./(sqrt(ed2));
subplot(4,1,2)
plot(u2)
c31=sum(c.*u1*dt);
c32=sum(c.*u2*dt);
d3=c-((c31.*u1)+(c32.*u2));
ed3=sum(d3.*d3.*dt);
u3=d3./(sqrt(ed3));
```

```
subplot(4,1,3)
plot(u3)
c41=sum(d.*u1*dt);
c42=sum(d.*u2*dt);
c43=sum(d.*u3*dt);
d4=d-round(((c41.*u1)+(c42.*u2)+(c43.*u3)));
ed4=sum(d4.*d4.*dt);
u4=d4./(sqrt(ed4));
subplot(4,1,4)
plot(u4)
```

Plot:



2. Find the co-ordinates

Sol:

Signal Set1:

Matlab code :

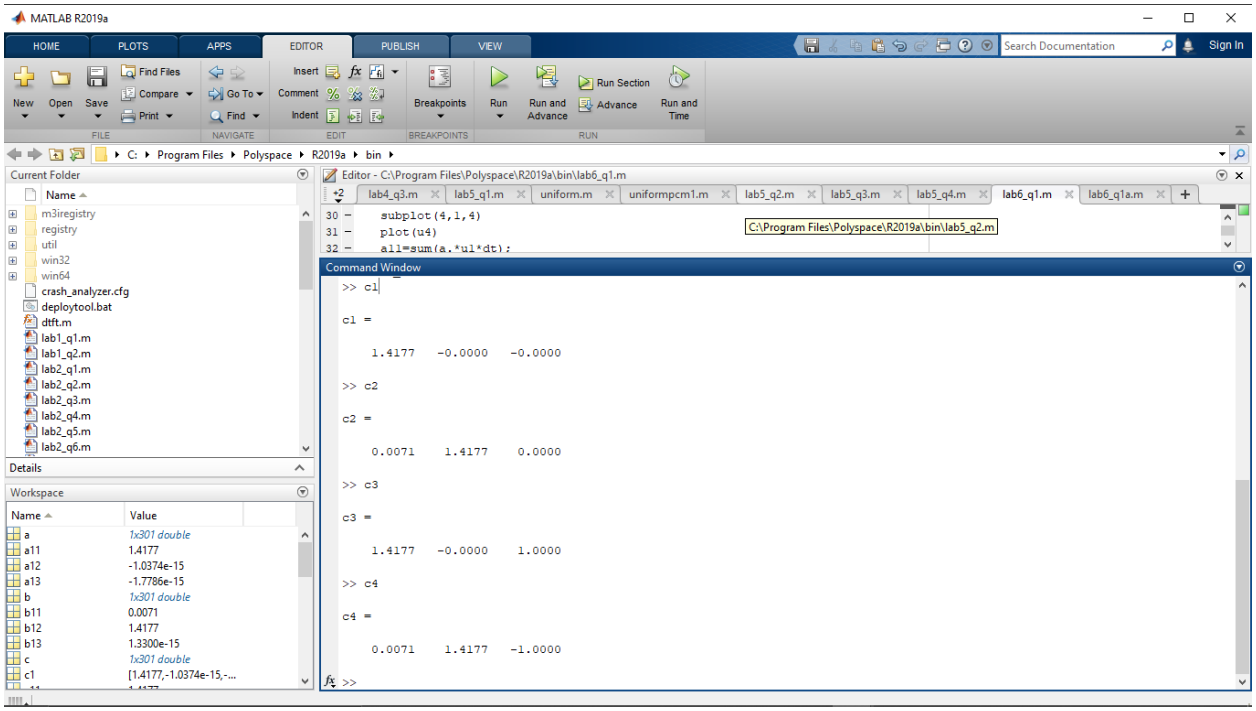
```
a11=sum(a.*u1*dt);
a12=sum(a.*u2*dt);
a13=sum(a.*u3*dt);
b11=sum(b.*u1*dt);
b12=sum(b.*u2*dt);
b13=sum(b.*u3*dt);
c11=sum(c.*u1*dt);
c12=sum(c.*u2*dt);
c13=sum(c.*u3*dt);
d11=sum(d.*u1*dt);
d12=sum(d.*u2*dt);
d13=sum(d.*u3*dt);
c1=[a11 a12 a13];
c2=[b11 b12 b13];
c3=[c11 c12 c13];
c4=[d11 d12 d13];
```

```
c1 =  1.4177   -0.0000   -0.0000

c2 =  0.0071    1.4177    0.0000

c3 =  1.4177   -0.0000    1.0000

c4 =  0.0071    1.4177   -1.0000
```



Signal Set 2:

Matlab code:

```
a11=sum(a.*u1*dt);
a12=sum(a.*u2*dt);
a13=sum(a.*u3*dt);
b11=sum(b.*u1*dt);
b12=sum(b.*u2*dt);
b13=sum(b.*u3*dt);
c11=sum(c.*u1*dt);
c12=sum(c.*u2*dt);
c13=sum(c.*u3*dt);
d11=sum(d.*u1*dt);
d12=sum(d.*u2*dt);
d13=sum(d.*u3*dt);
c1=[a11 a12 a13];
c2=[b11 b12 b13];
c3=[c11 c12 c13];
c4=[d11 d12 d13];
```

```
c1 = 1.4177   -0.0000    0.0000
c2 = 0.0071    1.4177    0.0000
c3 = -0.0071   -1.4177    1.0000
c4 = 1.4177   -0.0000    1.0000
```