# MC Practicals

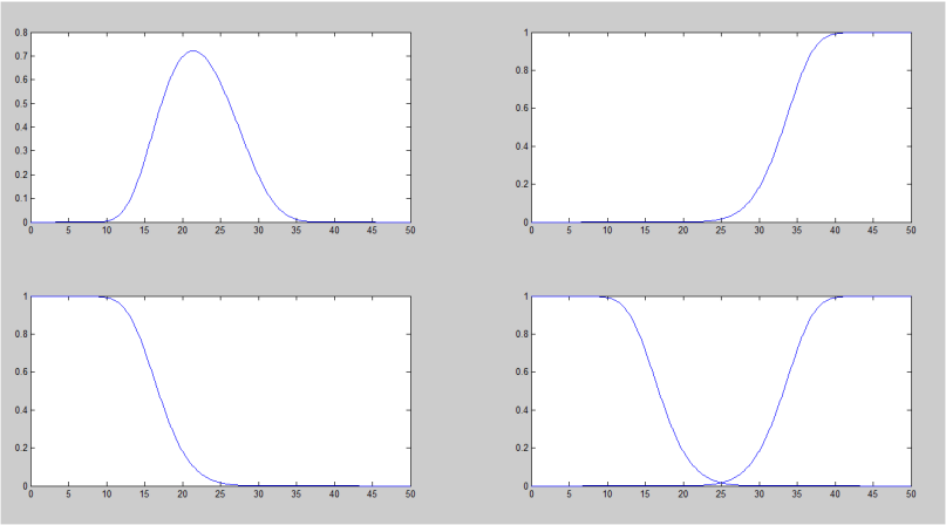
## 1. Frequency Reuse (MATLAB)

```
clc
clear all
close all
a=input('Total Geographical Service Area= ');
n1=input('Cluster size 1= ');
s=input('Total number of radio channels= ');
acell=input('Area of each cell= ');
%Part 1
k1=s/n1;
disp('No of channels/cell= ');
disp(k1);
m1=a/(n1*acell);
c1=m1*s;
disp('System Capacity');
disp(c1);
%Part 2
q=input('Frequency Reuse Factor= ');
r=sqrt((2*acell)/(3*sqrt(3)));
d=q*r;
disp('Minimum Reusable distance= ');
disp(d);
%Part 3
n2=input('Cluster size 2= ');
k2=s/n2;
disp('No of channels/cell= ');
disp(k2);
m2=a/(n2*acell);
c2=m2*s;
disp('System Capacity');
disp(c2);
change=((c2-c1)/c1)*100;
disp('% Change in System Capacity');
disp(change);
```

```
Total Geographical Service Area= 4200
Cluster size 1= 7
Total number of radio channels= 1001
Area of each cell= 12
No of channels/cell=
   143

System Capacity
       50050

Frequency Reuse Factor= 12
Minimum Reusable distance=
   25.7897

Cluster size 2= 4
No of channels/cell=
  250.2500

System Capacity
  8.7588e+004

% Change in System Capacity
    75
```

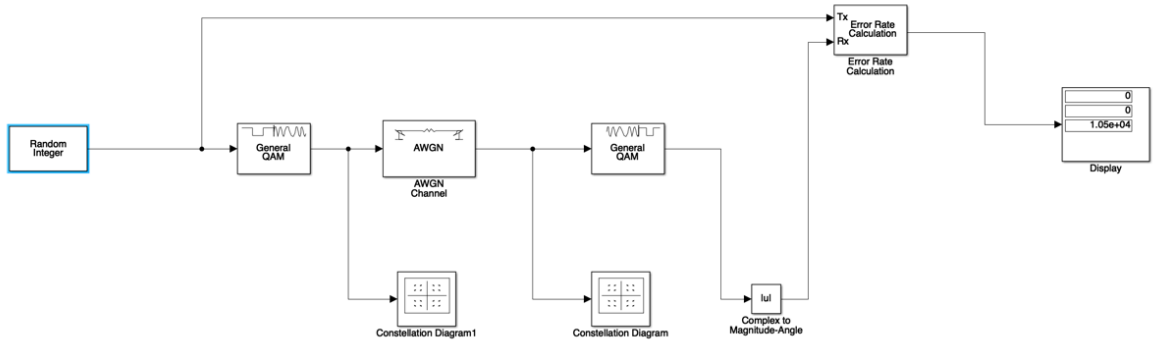
## 2. Handoff Algorithm (MATLAB)

```
clc
clear all
close all
pr=-85;
ph=-95;
k1=0;
k2=30;
sig=6;
D=50;
d=0:0.1:50;
u1=k1-(k2.*(log(d)));
u2=k1-(k2.*(log(D -d)));
a=(u1-pr)/sig;
b=(u2-pr)/sig;
c=(u1-ph)/sig;
p=(pr-u2)/sig;
e=(u2-ph)/sig;
f=(pr-u1)/sig;
Pout=qfunc(a).*qfunc(b);
Pass1=qfunc(c).*qfunc(p);
Pass2=qfunc(e).*qfunc(f);
figure(1)
subplot(2,2,1)
plot(d,Pout);
subplot(2,2,2)
plot(d,Pass1);
subplot(2,2,3)
plot(d,Pass2);
subplot(2,2,4)
plot(d,Pass1);
hold on
plot(d,Pass2);
```

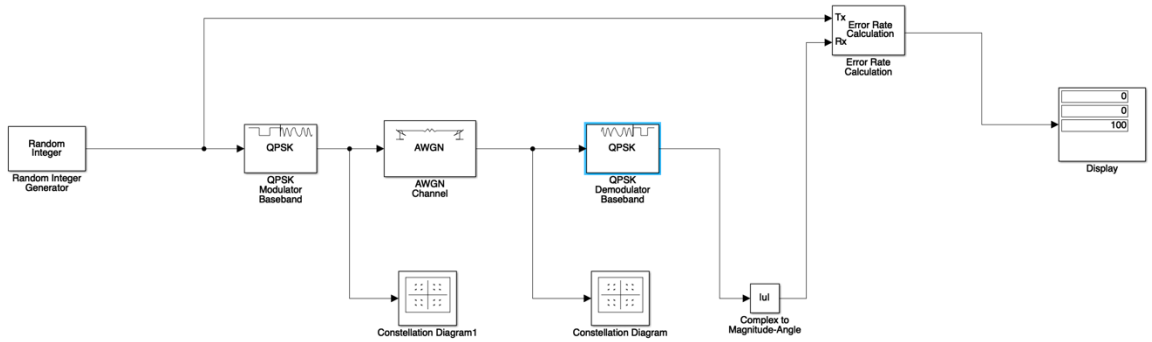


## 3. Adaptive Modulation (Simulink)

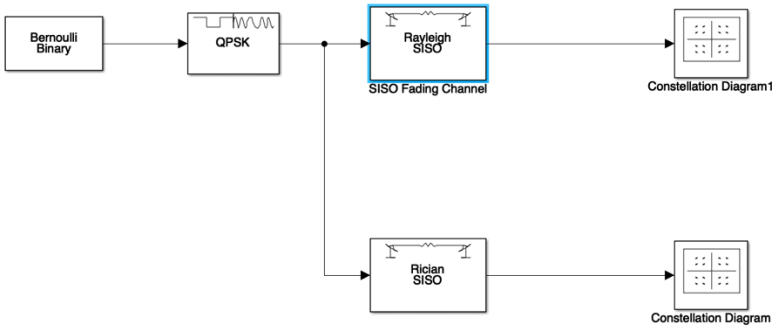
## QAM




## QPSK




## 4. Rayleigh and Rician (Simulink)



## 5. Orthogonal Walsh Code (MATLAB)

```
clear all
close all
A=[1 1 0 1 0 0 1];
B=[1 1 0 0 0 0 0];
c=A.*B;
d=sum(c);
if (mod(d,2)==0)
   disp("Orthogonal");
else
   disp("Not Orthogonal");
end
P=[-1 1 -1 1 -1 1 -1 1];
Q=[-1 -1 1 1 -1 -1 1 1];
R=[-1 1 1 -1 -1 1 1 -1];
S=[-1 -1 -1 -1 1 1 1 1];
l=(P+Q+R+S).*R;            %try for R; P+Q; P+Q+R as well
m=sum(l);
n=m/8;
if (n==1)
   disp("Message Received")
else
   disp("Message Lost")
end
```

**OUTPUT:**

P+Q will give output “Message Lost”, the rest will give “Message Received”

## 6. GSM and CDMA Sums (SCILAB)

```
clc
clear all
//1
Rb=270833;
Tb=1/Rb;
B=0.3/Tb;
B=B/1000;
mprintf('1) 3dB Bandwidth for Gaussian LPF = %f KHz\n',B);
//2
Rb=270833;
C=Rb/0.4;
B=200000;
T=C/B;
SN=(2^T)-1;
SNdB=10*log10(SN);
mprintf('\n 2) The corresponding required theoretical S/N = %f\n',SNdB);
//3
C=270833;
B=200000;
BW=C/B;
mprintf('\n 3) Bandwidth Efficiency = %f\n',BW);
//4
B=1250;
R=9.6
SRmindB=3;
SRmaxdB=9;
SRmin=10^(3/10);
SRmax=10^(9/10);
Mmin=(B/R)*(1/SRmax);
Mmax=(B/R)*(1/SRmin);
mprintf('\n 4) The IS-95 CDMA system can support %i to %f users',Mmin,Mmax);
```

**OUTPUT**

1) 3dB Bandwidth for Gaussian LPF = 81.249900 KHz
2) The corresponding required theoretical S/N = 9.754256
3) Bandwidth Efficiency = 1.354165
4) The IS-95 CDMA system can support 16 to 65.258754 users

## 7. Radio Propagation Models Sums (SCILAB)

```
clc
clear all
c=3*10^8;
//Q1
grdb1=5
pt=113
r1=11000
gr1=10^(grdb1/10)
eirp1=pt*gr1
disp('Q1')
disp("EIRP is")
disp(eirp1)
pd1=eirp1/(4*%pi*r1^2)*10^9
disp("Power density in nW/m2 is")
disp(pd1)
//Q2
disp('Q2')
f2=800*10^6
ht2=30
hv2=2
r2=10000
Lpm2=40*log10(r2)-20*log10(ht2)-20*log10(hv2);
disp("Path loss using Ray propogation is")
disp(Lpm2)
Lpf2=32.4+20*log10(r2/1000)+20*log10(f2/10^6)
disp("Path loss using Space propogation is")
disp(Lpf2)
//Q3
disp('Q3')
pt3=100
l03=30
pt3dbm=10*log10(pt3*1000)
disp("Pt in dB is")
disp(pt3dbm)
pr3dbm=-100
lp3=pt3dbm-pr3dbm
disp("Lp in dB is")
disp(lp3)
r3=10^((lp3-l03)/40)
disp("Radio Coverage in km is")
disp(r3/1000)
```

```
//Q4
disp('Q4')
fc4=800
ht4=30
hr4=2
lph4=68.75+26.16*log10(fc4)-13.82*log10(30)+(44.9-6.55*log10(ht4))*log10(10)
disp("Free space path loss in dB is")
disp(lph4)
lf4=110.5
disp("Difference between two path loss values in dB is")
dif4=lph4-lf4
disp(dif4)
//Q5
disp('Q5')
f5=900*10^6
r5=1000
lam5=c/f5
lpf5=20*log10(4*%pi*r5/lam5)
disp("Free space path loss in dB is")
disp(lpf5)
//Q6
disp('Q6')
pt6=10
gt6=9
gr6=4
f6=250
r6=25
tl6=20
pt6=10*log10(pt6*1000)
disp("Pt in dB is")
disp(pt6)
lpf6=32.44+20*log10(r6)+20*log10(f6)
disp("Path loss in dB is")
disp(lpf6)
tcl6=3/100
tloss6=tcl6*tl6
disp("Transmitter antenna cable loss in dB is")
disp(tloss6)
rloss6=0.2
disp("Power Delivered in dBm is")
pd6=pt6+gt6+gr6-lpf6-tloss6-rloss6
disp(pd6)
```

**Q1**

EIRP is

357.33738

Power density in nW/m2 is

235.0083

**Q2**

Path loss using Ray propogation is

124.43697

Path loss using Space propogation is

110.4618

**Q3**

Pt in dB is

50.

Lp in dB is

150.

Radio Coverage in km is

1.

**Q4**

Free space path loss in dB is

159.50587

Difference between two path loss values in dB is

49.005874

**Q5**

Free space path loss in dB is

91.526622

**Q6**

Pt in dB is

40.

Path loss in dB is

108.3576

Transmitter antenna cable loss in dB is

0.6

Power Delivered in dBm is

- 56.1576