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clc;
clear all;

%Initialization
Ts=0.001;
fc=5000;
bitl=8;
M=2;
Am=2;
%Bit Sequence
bit_s=zeros(1,bitl);
for ib=1:bitl
    if rand<0.5
        bit_s(ib)=0;
    else
        bit_s(ib)=1;
    end
end
%bit_s

%ASK modulation
bit_len=length(bit_s);
t=0:0.00001:(bit_len*Ts);
bpw=Am*cos(2*pi*t*fc);
bit_mat=[];
bit_exp=[];
for i=1:bit_len
    for j=i:1:(length(t)-1)/bit_len
        bit_exp(j)=bit_s(i);
    end
    bit_mat=[bit_mat bit_exp];
    bit_exp=[];
end
bit_mat=[bit_mat 0];
x=bit_mat.*bpw;

base_band_in_phase=[];
%base_band_quadrature=[];
for i=1:length(bit_mat)
    if(bit_mat(i)==0)
        base_band_in_phase=[base_band_in_phase (-1)*Am];
    else
        base_band_in_phase=[base_band_in_phase Am];
    end
end

%Plotting

xticks([0:Ts:(bit_len*Ts)])

subplot(3,1,1);
plot(t,Am*bit_mat);
axis([0 (bit_len*Ts) -1 3]);
xlabel('Message duration');
ylabel('bit');
title('Bit Sequence');
xticks([0:Ts:(bit_len*Ts)])
xticklabels({'0','Ts','2Ts','3Ts','4Ts','5Ts','6Ts','7Ts','8Ts','9Ts','10Ts','11Ts','12Ts','13Ts','14Ts','15Ts','16Ts'})

subplot(3,1,2);
title("Bandpass Waveform 2-ary ASK")
plot(t,x)

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axis([0 (bit_len*Ts) -4 4]);
xlabel('Time');
ylabel('Am');
title('Bandpass Waveform for 2-ASK');
xticks([0:Ts:(bit_len*Ts)])
xticklabels({'0','Ts','2Ts','3Ts','4Ts','5Ts','6Ts','7Ts','8Ts','9Ts','10Ts','11Ts','12Ts','13Ts','14Ts','15Ts','16Ts'})

subplot(3,1,3);
plot(t,base_band_in_phase);
axis([0 (bit_len*Ts) -4 4]);
xlabel('Time');
ylabel('Am');
title('Base Band In-Phase component');
xticks([0:Ts:(bit_len*Ts)])
xticklabels({'0','Ts','2Ts','3Ts','4Ts','5Ts','6Ts','7Ts','8Ts','9Ts','10Ts','11Ts','12Ts','13Ts','14Ts','15Ts','16Ts'})

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