

Task 3

Q1-Q10

```
bit_seq_len = 10^4; % number of bits
SNR_list = [0:10]; % snr from 0 to 10

for x1 = 1:length(SNR_list)

    % Transmitter
    bit_seq = randi([0 1],1 ,bit_seq_len); % random bit sequence
    symbol= 2*bit_seq-1; %0 to -1 and 1 to 1
    h= [0.2 0.9 0.3]; % channel response
    c_out = conv(symbol,h);
    Eb=1;
    No=Eb/(10^(SNR_list(x1)/10));
    AWGN=No*randn(1,max(size(c_out)));

    % Noise addition
    y = c_out + AWGN; % additive white gaussian noise
    yAWGN=symbol+AWGN(1:bit_seq_len);%sybols + noise (no channel response)
    for x2 = 1:4
        hMat = toeplitz([h([2:end]) zeros(1,2*x2+1-length(h)+1)], [ h([2:-1:1]) zeros(1,2*x2+1-length(h)+1)]);
        b = zeros(1,2*x2+1);

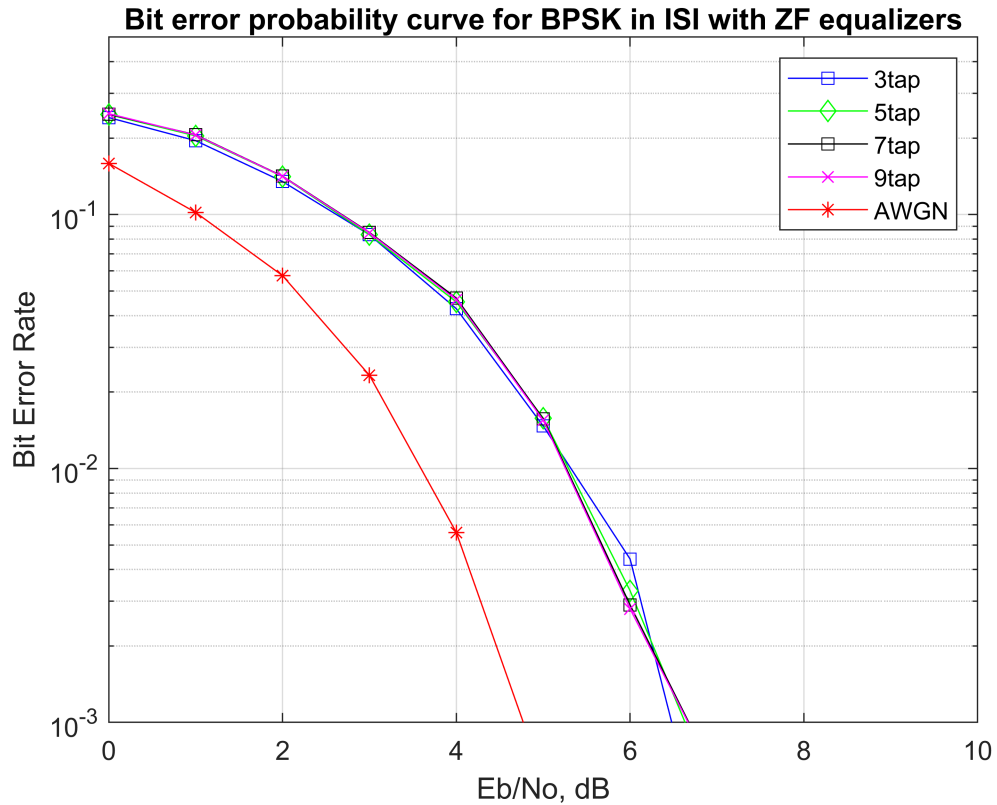
        b(x2+1) = 1;
        c = [inv(hMat)*b.'].';% coefficient set
        yFilt = conv(y,c);
        yFilt = yFilt(x2+2:end);
        ySamp = yFilt(1:1:bit_seq_len);
        size(ySamp);

        %decoding and calculating the number of errors
        ipHat = ySamp>0;
        yAWGN= yAWGN>0;
        nAWGN(1,x1)=size(find([bit_seq- yAWGN]),2);
        nErr(x2,x1) = size(find([bit_seq- ipHat]),2);
    end
end
simBer = nErr/bit_seq_len; % Bit error rate

% plot

figure
semilogy(SNR_list,simBer(1,:), 'bs-');
hold on
semilogy(SNR_list,simBer(2,:), 'gd-');
semilogy(SNR_list,simBer(3,:), 'ks-');
semilogy(SNR_list,simBer(4,:), 'mx-');
semilogy(SNR_list,nAWGN/bit_seq_len, 'r*-');
```

```
axis([0 10 10^-3 0.5])
grid on
legend('3tap', '5tap', '7tap', '9tap', 'AWGN');
xlabel('Eb/No, dB');
ylabel('Bit Error Rate');
title('Bit error probability curve for BPSK in ISI with ZF equalizers');
```



Q11

In the Zero force Equilizer multipath channel noise also get amplified. So the bt error rate is high. Since there is no any amplification in the noise in AWGN channel BER is less than Zero force equilizer multipath channel.