

Ερώτηση 2

A) Without gray coding

After modulation, the baseband signal is modulated onto a carrier frequency and transmitted. The received symbols are computed after demodulation, and the I/Q components are compared with the ideal constellation points to detect the transmitted symbols. In the constellation diagram, the received symbols (the noisy versions of the transmitted symbols) are shown as red dots ("r."). These points align perfectly with the ideal ones only for very high SNR (above 40 dB), while in other cases, we observe that the red points spread further than the blue ones due to noise (the detector makes errors and places them in different positions).

```
constellation = [cos(theta).' sin(theta).']; % Ideal constellation
figure;
plot(received_symbols(:,1), received_symbols(:,2), 'r.');
```

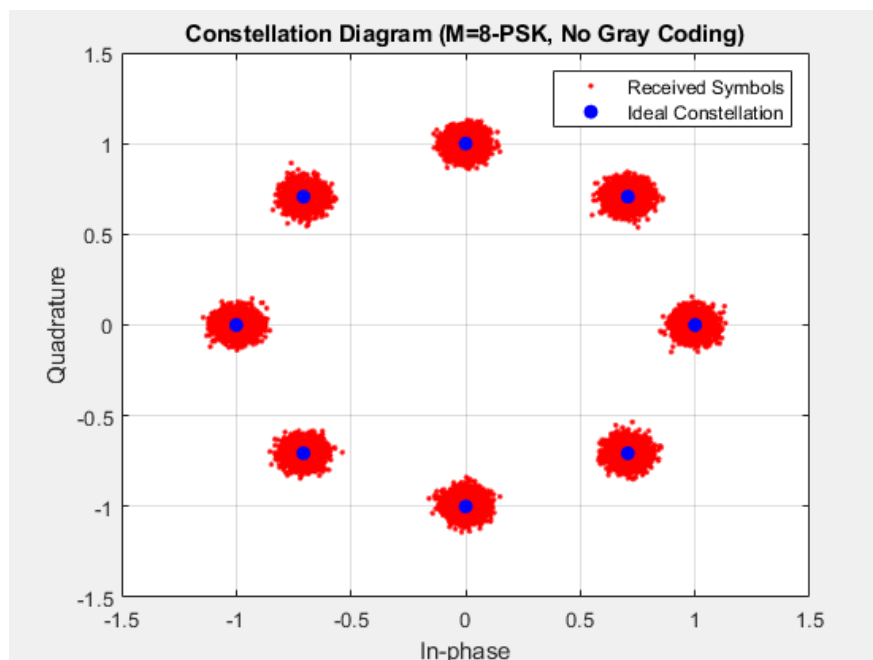
```
hold on;
plot(constellation(:,1), constellation(:,2), 'bo', 'MarkerFaceColor',
'b');
```

```
xlabel('In-phase');
ylabel('Quadrature');
```

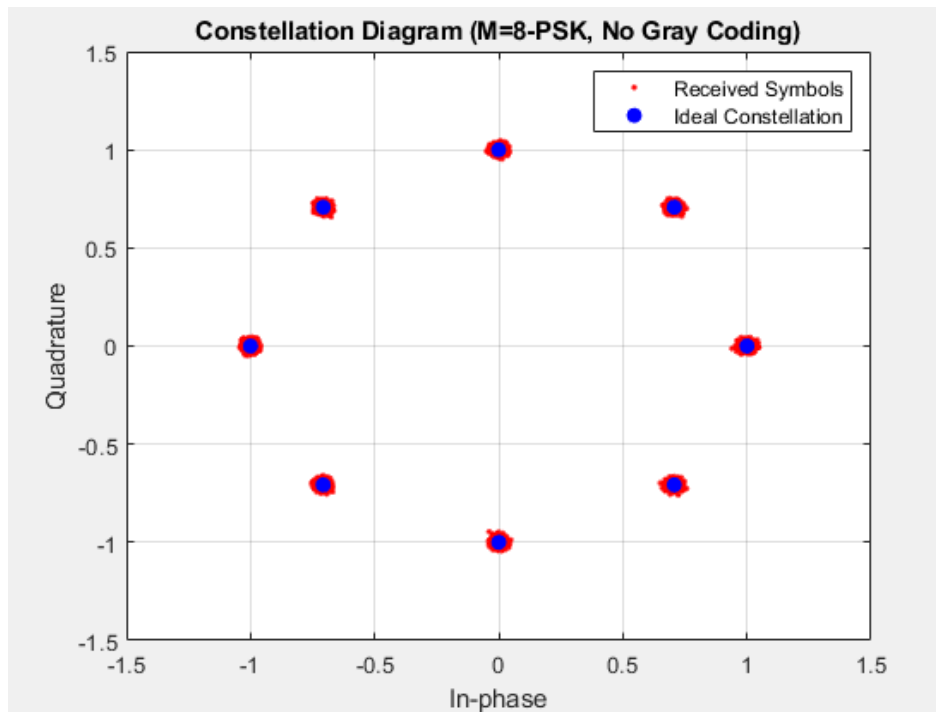
```
title(sprintf('Constellation Diagram (M=%d-PSK, No Gray Coding)', M));
legend('Received Symbols', 'Ideal Constellation');
```

```
grid on;
```

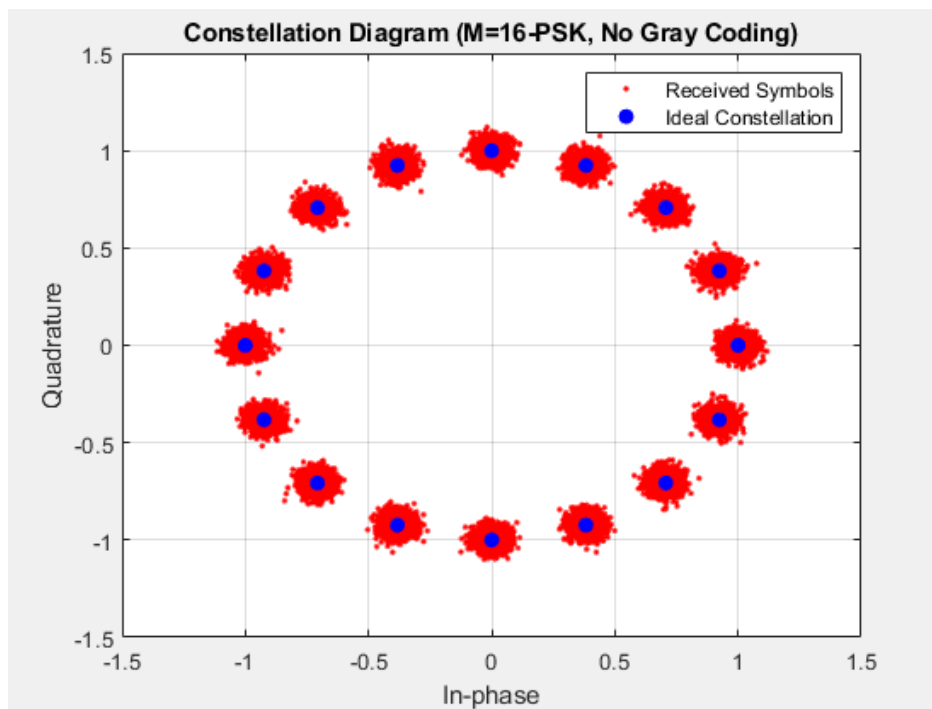
M=8: SNR 20 db



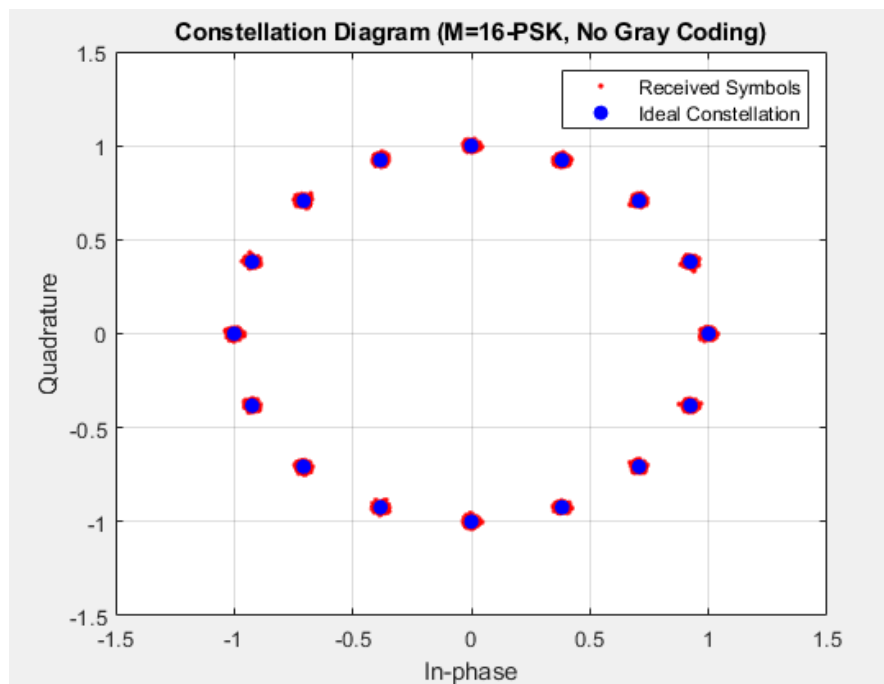
SNR 30 db



M=16: SNR 20 db

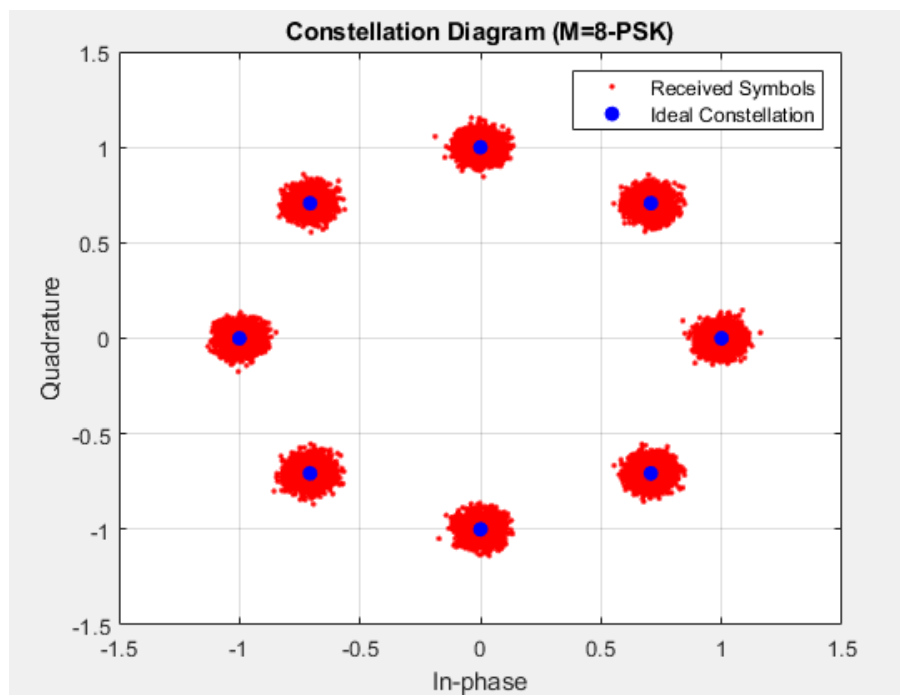


SNR 30db

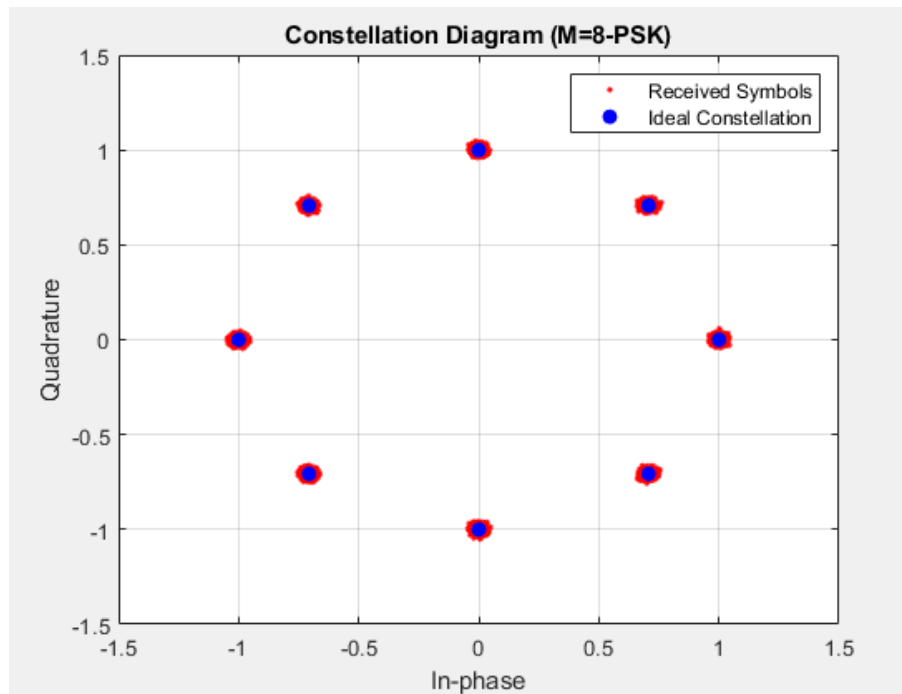


B) Με κωδικοποίηση gray

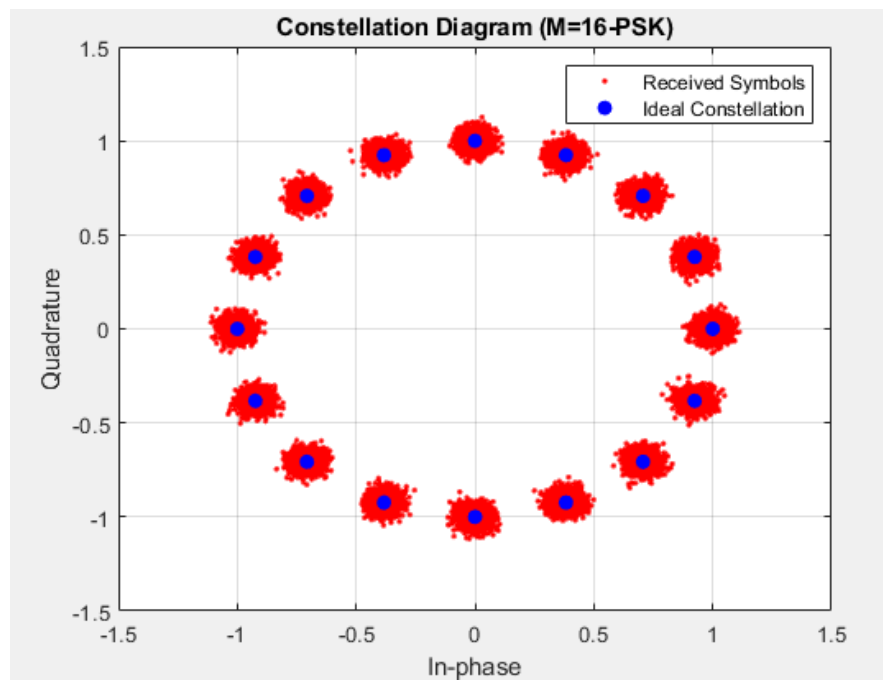
M=8: SNR 20 db



SNR 30 db



M=16: SNR 20 db



SNR 30 db

