1. Write Matlab code to compute both the linear and circular convolutions of the shown two discrete-time sequences:

```
x1= [0 0.5 1 1 1 1 0.5 0];
x2= [1 1 1 1 1 1 0 0];
```

2. Compute the DFT of the signal below and display its spectral magnitude and phase. Also, show how to increase its spectral resolution by a factor of 8 and display the spectral magnitude and phase in this case.

```
N= 16;
sig1= zeros(N,1);
sig1(1:N/2+1)= 0:N/2;
sig1(N/2+1:N)= N/2:-1:1;
```

3. Consider the ECG data in the variable “ECGn” stored in the matlab data file “ECGdata.mat”. The ECG samples in this variable represent samples from 64 patients and each was obtained using a sampling rate of 360 Sa/s. Show how to change the sampling rate of these data to become 1000 Sa/s and display the data with original and new sampling rates for the data of a single patient.
   Hint: to get the variable “ECGn”, just load the data from the data file using:

   ```
   load ('ECGdata.mat');
   ```

4. Consider the sampling of two sinusoidal signals using a sampling rate of 100 Sa/s. The signals have frequencies of 10 Hz and 9.67687 Hz respectively. The number of samples for both signals was 100 samples. Compute the frequency spectral magnitude for both signals and explain the difference based on your expectation of the shape of the spectrum of a sinusoidal signal.

5. [EXTRA CREDIT] A continuous-time periodic signals given as: $x1(t) = [u(t-1)-u(t-3)] \cos(2\pi t/3)$.
   a. Plot the signal and its Fourier transform using symbolic math.
   b. Sample this signal with sampling period of 0.1 and plot the sampled signal and its DFT.
   c. Sample this signal with sampling period of 1 and plot the sampled signal and its DFT.
   d. Sample this signal with sampling period of pi/2 and plot the sampled signal and its DFT.
   e. Comment on the different results obtained in parts b, c, and d above.

## Note:

Deliver project as a single documented Matlab script “.m” that generates the results when called within Matlab through Blackboard by due date