ME/EXTC/CBCGS/Sem-I/MBSPA 11/12/2017

Q. P. Code :27327

(3 Hours) **Total Marks: 80**

N.B. : (1) Questions No.**1** is **compulsory**.
(2) Solve any **three** questions out of remaining **five** questions
(3) Draw neat labeled diagram whenever necessary
(4) Assume suitable data if necessary

Q.1 Solve any **four** out of five **(5x4)**

i) Determine the output power spectral density of the system whose impulse response is $h(n) = 0.5^n U(n)$. Input to the system is white noise with PSD = σ^2

ii) Explain an Adaptive System with suitable example.

iii) Describe filter bank theory related to wavelet transform.

iv) Explain with block diagram the data acquisition system for ECG.

v) With mathematical concept explain the generation of reverberation effect synthetically using signal processing.

Q.2 a) Compare Short Time Fourier Transform and Spectrogram with the mathematical concept and plots. **6**

b) Describe Welch method for determination of Power Spectrum estimate **6**

c) Explain with suitable mathematical approach Steepest-Descent Algorithm (SDA) **8**

Q.3 a) Derive Least Mean Square (LMS) adaptive algorithm. Discuss convergence and stability properties of the LMS algorithm? **12**

b) Given that input sequence f = [8, 6, 5, 5, 4, 6, 10, 12], find level-1 Haar wavelet transform and verify the result by using its inverse Haar transform. **8**

Q.4 a) Explain with suitable diagram the application of adaptive system for echo cancellation in data transmission over telephone channel. **10**

b) Describe how Wavelet transform can be used for signal denoising. Also, discuss hard thresholding and soft thresholding for wavelet based denoising. **10**

Q.5 a) Describe the Multi-Resolution Analysis (MRA)? How Discrete Wavelet Transform (DWT) is used for MRA. **10**

b) Explain various pre-processing operations required to perform before analysis of ECG signal with suitable mathematical concepts. **10**

Q.6 a) Describe audio processing for generating chorus effect and flanging effect with block diagram and mathematical concept. **10**

b) Explain with the block diagram and algorithm for adaptive removal of Ocular Artefacts from human EEGs. **10**
