Paper / Subject Code: 59703 / Modern Digital Signal Processing Applications.

ME Sem I / EXTC / Choice base / SH 2018 05/12/2001

Maximum Marks: 80

Time: 3 hrs.

N. B.

1. Q.1 is compulsory.
2. Answer any **three** out of the remaining five questions.
3. Figures to the right indicate marks.
4. Answer to the questions should be grouped and written together.

Q1 Solve any **four** out of five

a. Compare the LMS and RLS algorithms 5

b. Comparison of Short Time Fourier Transform and Wavelet Transform 5

c. What are the performance measures for QRS detection? 5

d. State the concept of Multi Resolution Analysis (MRA) using Wavelet. 5

e. Describe with suitable diagram adaptive echo canceller 5

2.a Derive the LMS Algorithm ans explain its limitations 10

b. Explain analysis and synthesis filter bank using Wavelet transform with suitable diagram and related mathematics. 10

3a. Describe hard thresholding and soft thresholding for wavelet based denoising. Also, explain speckle removal using wavelet transform. 10

b. Explain one method of QRS separation in an ECG signal in detail. 10

4a Given the system modeling described in following Figure 1 10

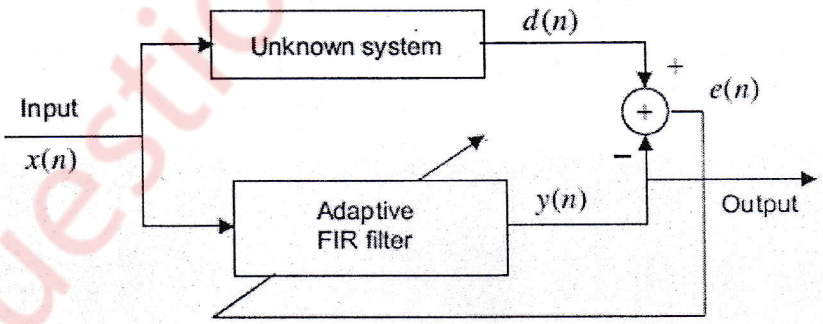

Figure 1. Adaptive System for unknown system modeling

using a single-weight adaptive filter $y(n) = W.\ x(n)$ to perform the system-modeling task,

i) Set up the LMS algorithm to implement the adaptive filter assuming that initially $W = 0$ and $\mu = 0.5$;

ii) Perform adaptive filtering to obtain $y(0), y(1), y(2), y(3)$ given that

$d(0) = 1$; $d(1) = 2$; $d(2) = -2$; $d(3) = 2$

$x(0) = 0.5$; $x(1) = 1$; $x(2) = -1$; $x(3) = 1$

Comment on the system thus modeled.

b.	With mathematical concept discuss the Yule Walker method for AR models.	10
5a.	Discuss various sources of Ocular artefacts in EEG signals. Explain the methods for removal and control of ocular artefacts in EEG signal	10
b.	With a neat diagram of linear combiner and Prove the Wiener Hopf Equation and derive the expression for MSE and Minimum value of MSE.	10
6a.	Describe Welch Method and Bartlett method of Power Spectrum Estimation.	10
b.	Show that energy density spectrum of a signal equals to Fourier transform of autocorrelation of a signal.	5
c.	Discuss in brief various Time Domain operations in Musical Sound Processing.	5

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