

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -1 EXAMINATION- FEB-2023

COURSE CODE (CREDITS): 19B1WEC836 (03)

MAX. MARKS: 15

COURSE NAME: Applied Medical Signal Processing

COURSE INSTRUCTORS: Dr. Sunil Datt Sharma

MAX. TIME: 1 Hour

Note: All questions are compulsory. Marks are indicated against each question in square brackets.

Q1. Determine the frequency resolution of the Bartlett, Welch, and Blackman-Tukey methods of power spectrum estimation for quality factor $Q=100$, Assume that overlap in the Welch method is 50% and length of sample sequence is 2000. [CO-2, Marks-03]

Q2. Bartlett method is used to estimate the power spectral density of a process sequence of $N=1000$. What is the maximum length M of the subsequence that may be used to have frequency resolution $\Delta f = 0.005$. [CO-2, Marks-02]

Q3. Compute the discrete Fourier transform of the signal $x[n] = [1, 2, 1, 2, 1, 2,]$ and plot the normalized magnitude spectrum to show the dominant frequency present in the signal. [CO-2, Marks-02]

Q4. Compute the Autoregressive model coefficients $a = [a_1, a_2, a_3]$, if its autocorrelation vector is $r = [0.1, 0.2, 0.3]$ and autocorrelation matrix is $R = \begin{bmatrix} 0.6 & 0.7 & 0.2 \\ 0.1 & 0.2 & 0.4 \\ 0.1 & 0.3 & 0.2 \end{bmatrix}$. [CO-2, Marks-02]

Q5. How and from where the biological signals EEG, ECG, EMG, ABP, and Spo2 are generated? Also, write their amplitude range and draw the waveform of each signal. [CO-1, Marks-04]

Q6. Discuss the applicability and limitations of the parametric and non-parametric power spectral estimation methods and also write the name of these methods. [CO-2, Marks-02]