Printed Pages : 4

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EBM603

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 101608

Roll No. | | | | | | | | | | |

B. Tech.

(SEM. VI) THEORY EXAMINATION, 2014-15

BIOMEDICAL SIGNAL PROCESSING

Time : **3** Hours] [Total Marks : **100**

Note : Answer all five questions.

1 Answer any four parts of the following : **4×5=20**

(a) Find the Z-transform of the sequence

x (n) = $\alpha^n u(n)$

(b) Find the Z-transform of

$$x(n) = 2^n u(n) + 3\left(\frac{1}{2}\right)^n u(n)$$

(c) Find the H-point DFT of the sequence

$x(n) = (-1)^n \quad 0 \le n \le N-1$

where N is an even number.

(d) Explain the difficulties in the acquisition of biomedical signals.

(e) Explain use of digital computer in biomedical application and give some examples.

(f) What is EEG ? Why is it much more difficult to recognize than ECG ?

2 Answer any four parts of the following : **4×5=20**

(a) What is the most common artifact observed in ambulatory ECG ? Explain.

(b) Explain the properties of Fourier Transform.

(c) Determine whether or not the signal below are periodic and for each signal that is periodic, determine the fundamental period.

(i) $x(n) = \cos(0.125\,\pi n)$

(ii) $x(n) = \sin(\pi + 0.2n)$

(d) Find the z-transform of cos $w_o n$.

(e) What is the use of MATLAB on various bio-medical signals ?

(f) What is the difference between energy and power signal ? Explain with examples.

3 Attempt any two parts of the following : **2×10=20**

(a) Find the Fourier transform of e^{-at} u(t) with its magnitude and phase spectrum.

(b) Find the Kaiser window parameters, β and N to design a low pass filter with a cut off frequency $w_c = \pi/2$, a stop band ripple $\delta_s = 0.002$ and a transition bandwidth no larger than 0.1π.

(c) State and prove sampling theorem with its spectrum.

4 Attempt any two parts of the following : **2×10=20**

(a) Let x(n) be a sequence of length 1024 that is to be convolved with a sequence h(n) of length L. For what values of L is it more efficient to perform the convolution. Directly than it is to perform the convolution by taking the inverse DFT of the product X(k) H(k) and evaluating the DFTs using a radix -2 FFT algorithm.

(b) Give details about Auto correlation and cross correlation.

(c) Write short note on Analog to Digital conversion.

5 Attempt any two parts of the following : **2×10=20**

(a) Find two different continuous time signals that will produce the sequence $x(n) = \cos(0.15 n \pi)$ when sampled with a sampling frequency of 8 kHz.

(b) Design a low pass filter using Kaiser window.

(c) The input to a casual linear shift - invariant system is

$$x(n) = u(-n-1) + \left(\frac{1}{2}\right)^n u(n).$$

The Z-transform of the output of this system is

$$y(z) = \frac{-\frac{1}{2} z^{-1}}{\left(1-\frac{1}{2} z^{-1}\right)\left(1+z^{-1}\right)}.$$

Find the system function H(z) of the filter.