

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

**Paper ID : 101608**

Roll No. 

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**B.TECH.**

**Theory Examination (Semester-VI) 2015-16**

**BIO MEDICAL SIGNAL PROCESSING**

***Time : 3 Hours***

***Max. Marks : 100***

**Section-A**

- 1. Attempt all parts. All parts carry equal marks. Write answer of each part in short. (2×10 = 20)**

- (a) Write down the convergence condition for Z transform.
- (b) What are the conditions for a system to be stable?
- (c) What is the difference between autocorrelation and cross correlation?
- (d) What is Gibbs phenomena?
- (e) Explain aliasing phenomena.
- (f) Plot the magnitude responses for ideal Low pass and High pass filters.

- (g) What does MATLAB stand for? Who did developed the MATLAB software?
- (h) What is FFT?
- (i) How the biomedical signals are acquired in a digital computer?
- (j) What is the use of Evoked signals?

### Section-B

2. Attempt any five questions from this section. (10×5=50)

- (a) Find out the Inverse Z-transform for the given function

$$X(z) = \frac{3 - \frac{5}{6}z^{-1}}{\left(1 - \frac{1}{4}z^{-1}\right)\left(1 - \frac{1}{3}z^{-1}\right)}, \quad |z| > \frac{1}{3}$$

- (b) Explain the process of Digital to Analog Conversion (DAC).
- (c) Explain energy and power signals. Determine the energy of the signal  $x(t) = \cos(10\pi t) \cdot u(t-2)$
- (d) What are the bio signals? Write down the application areas and explain.

(2)

P.T.O.

- (e) Compute the length-4 sequence from its DFT which is given by  $X(k) = \{4, 1-j, -2, 1+j\}$ .
- (f) Determine whether or not the signals below are periodic and for each signal that is periodic,

Determine the fundamental period.

(i)  $x[n] = 10 \sin(100\pi t) + 4 \cos(200\pi t)$

(ii)  $x[n] = \sin\left(\frac{6\pi}{7}n + 1\right)$

- (g) State and prove Sampling theorem.
- (h) Explain the use of MATLAB toolbox in Biomedical Signal processing.

### Section-C

**Note: Attempt any two questions from this section. (15×2=30)**

3. What are the properties of Fourier Transform? Find the Fourier transform of  $x(t) = Ae^{-t} / T_{u(t)}$
4. Design an FIR linear phase filter using Kaiser window to meet the following Specification

$$0.99 \leq |H(\omega)| \leq 1.01, \quad 0 \leq \omega \leq 0.19\pi$$

$$|H(\omega)| \leq 0.01, \quad 0.21\pi \leq \omega \leq \pi.$$

5. What is a system? Determine whether the system described by  $y(t) = x^2(t) + 5$  is :

- (i) Time variant or invariant
- (ii) Stable or Unstable
- (iii) Linear or Non-Linear.

