

GUJARAT TECHNOLOGICAL UNIVERSITY**BE- VIth SEMESTER-EXAMINATION – MAY- 2012****Subject code: 160305****Date: 19/05/2012****Subject Name: Biomedical Signal Processing****Time: 10:30 am – 01:00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

Q.1 (a) Give classification of signals. Distinguish multichannel and multidimensional signal. **07**

(b) Explain generalized block diagram and applications of DSP processors. **07**

Q.2 (a) Show that the phase of an allpass filter with $h(n)$ real, if plotted as a continuous function of ω , is nonpositive for all ω . **07**

(b) Structure for Discrete time systems **07**

OR

(b) Design a low-pass Butterworth filter that has a $3dB$ cutoff frequency of 1.5 kHz and an attenuation of 40 dB at 3.0 kHz . **07**

Q.3 (a) An FIR linear phase filter has a unit sample response that is real with $h(n)=0$ for $n<0$ and $n>7$. If $h(0)=1$ and the system function has a zero at $z=0.4e^{j\pi/3}$ and a zero at $z=3$, what is $H(z)$? **07**

(b) Write a short note on: minimum phase system. **07**

OR

Q.3 (a) For the system $H(z) = \frac{1+2z^{-1}+z^{-2}}{1-0.75z^{-1}+0.125z^{-2}}$ derive the direct form I and direct form II structures. **07**

(b) Explain basic network structures for FIR systems with examples. **07**

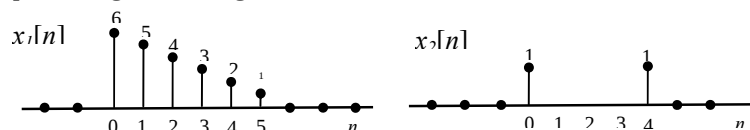
Q.4 (a) Show that the frequency response of an N^{th} order lowpass Butterworth filter is *maximally flat* at $\Omega = 0$ in the sense that the first $2N-1$ derivatives of $|H_a(j\Omega)|^2$ are equal to zero at $\Omega = 0$. **07**

(b) Write short note on Equiripple Linear Phase FIR Filters Design. **07**

OR

Q.4 (a) List the properties of discrete Fourier transform and discuss any two with an example. **07**

(b) Find 6-point and 10-point circular convolution for the finite-length sequences given in figure. **07**



Q.5 (a) Write short note on Goertzel Algorithm **07**

(b) Compare decimation-in-time and decimation-in-frequency FFT algorithms **07**

OR

Q.5 (a) Discuss the process of ECG analysis for arrhythmia detection. **07**

(b) Explain frequency based Heart Rate Variability signal analysis. **07**
