# PARUL UNIVERSITY
## FACULTY OF ENGINEERING & TECHNOLOGY
### B.Tech. Summer 2018-19 Examination

Semester: 6                                                         Date: 04/05/2019
Subject Code: 03111352                                    Time: 10:30am To 1:00pm
Subject Name: Biomedical Signal Processing            Total Marks: 60

**Instructions:**
1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

**Q.1    Objective Type Questions** - **(All are compulsory, Each Question carry one mark)**                                    **(15)**

1. The IIR filter designing involves _____.
   - (a) Designing of analog filter in analog domain and transforming into digital domain
   - (b) Designing of digital filter in analog domain and transforming into digital domain
   - (c) Designing of analog filter in digital domain and transforming into analog domain
   - (d) Designing of digital filter in digital domain and transforming into analog domain

2. The interface between an analog signal and a digital signal is _____.
   - (a) D/A converter
   - (b) A/D converter
   - (c) Modulator
   - (d) Demodulator

3. DIT Algorithm divides the sequence into _____.
   - (a) Positive and negative values
   - (b) Upper Higher and Lower spectrum
   - (c) Small and Large Samples
   - (d) Even and odd Samples

4. The Z-transform of $-5^n u[-n-1]$ is _____.
   - (a) $\frac{1}{1-5z}$
   - (b) $\frac{5z}{1-5z}$
   - (c) $\frac{1}{1-5z^{-1}}$
   - (d) $\frac{z}{1-5z^{-1}}$

5. FFT may be used to calculates_____.
   - (a) DFT
   - (b) IDFT
   - (c) Direct Z transform
   - (d) 1 and 2 are correct

6. A band pass signal extends from 1 KHz to 2 KHz. The minimum sampling frequency needed to retain all information in the sampled signal is _____.

7. The Fourier transform and the Z-transform both convert _____domain to _____domain.

8. Is the system function y[n] = x[n] + n x[n+1] causal or non causal?

9. Decimation is a process in which the sampling rate is _____.

10. The Function $\frac{\sin x}{x}$ is denoted by _____.

11. Enlist the types of Fourier Representation.

12. Define Filter. Why we used Filters?

13. Enlist the desirable sequences of Windowing Techniques.

14. How many multiplication and additions are required to compute N-point DFT using Radix-2 FFT?

15. Which Technique is used for the removal of movement artifact from ECG?

**Q.2    Answer the following questions. (Attempt any three)**                                    **(15)**

(A) Explain Principle Noise Canceller model with its necessary diagram.

(B) Let H(s) = $\frac{1}{(S+1)(S+2)}$ .
   - (i) Find Corresponding H (z) using impulse Invariant method. (ii) If fs= 5 sps. Find H[z].

**(C)** Compute 4 point IDFT of given sequence using Twiddle Factor.
$x[k] = \{2, 1+ j, 0, 1- j\}$.

**(D)** Perform Circular Convolution of Sequence
$X_1[n] = \{2, 0, 0, 1\}$ and $X_2[n] = \{4, 3, 2, 1\}$.

**Q.3 (A)** Draw Direct Form I and Direct Form II realisation for the given system function: **(07)**

$$y[n] - \frac{3}{4} y[n-1] + \frac{1}{8} y[n-2] = x[n] + \frac{1}{2} x[n-1]$$

**(B)** Determine $r_{xy}[l]$ and $r_{yx}[l]$ for given sequence **(08)**
$x[n] = \{-5, -2, 2, 3, 5, -3\}$

$y[n] = \{1, 1, 2, -1, 6, -3\}$ Using matrix method.

**OR**

**(B)** Compute Convolution of following signals. **(08)**
$x[n] = \{1, 2, 1, -1\}$ and $h[n] = \{1, 2, 3, 1\}$

Also verify your answer with tabular method.

**Q.4 (A)** Plot the magnitude and phase spectrum of the sampled data sequence $\{2, 0, 0, 1\}$, which **(07)** was obtained using a sampling frequency of 20 kHz. Select N=4.

**OR**

**(A)** Draw and Explain Pan-Tompkins QRS detection algorithm in detail. **(07)**

**Q.4 (B)** Given x[n] sequence, as follows $x[n] = \{1, 2, 3, 5, 5, 3, 2, 1\}$. Find Corresponding DFT **(08)** X[k] using DIT FFT Butterfly Structure.