Seat No.: _____ Enrolment No._____

# GUJARAT TECHNOLOGICAL UNIVERSITY

**ME - SEMESTER– I (OLD course)• EXAMINATION – SUMMER 2015**

**Subject Code: 713104** **Date: 16/05/2015**

**Subject Name: BIO-SIGNAL PROCESSING**

**Time: 10:30 am to 1:00 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)** | Explain moving average filters with its frequency and phase response. | **07** |
| | **(b)** | Explain simple one pole recursive filter. How position of pole will affect the stability of filters? | **07** |
| **Q.2** | **(a)** | Explain the rubber membrane concept with HPF example and their response. | **07** |
| | **(b)** | Explain any two digital integration techniques with its signal flow graph. | **07** |
| | | **OR** | |
| | **(b)** | Explain switched current source type DAC with necessary equations and circuit. | **07** |
| **Q.3** | **(a)** | Give details of pole and zero placements in Integer filters. | **07** |
| | **(b)** | Obtain the coefficients of an FIR low pass filter to meet the following specifications using window method<br>Stop band attenuation > 50 dB<br>Pass band edge frequency 1.5 KHz<br>Transition width 0.5 KHz<br>Sampling frequency 8KHz | **07** |
| | | **OR** | |
| **Q.3** | **(a)** | List the applications of adaptive filtering. Explain sine wave model of 50Hz adaptive cancellation. | **07** |
| | **(b)** | 1) Why FIR filters is inherently stable? | **02** |
| | | 2) A digital filter has the output sequence {3,2,3,0,0,0é } when its input is the unit impulse. If the input is a unit step, what is the output sequence? | **02** |
| | | 3) Suppose you have given a filter with a zero at 90 degree on the unit circle. You are asked to use this filter as a notch filter to remove 50 Hz noise. How will you do this? Can you use the same filter as a notch filter, rejecting different frequencies? | **03** |
| **Q.4** | **(a)** | Draw block diagram and flow chart of signal average. | **07** |
| | **(b)** | Explain mapping of S plane to Z plane. Give step for calculating coefficients of Bilinear Z transform method. | **07** |
| | | **OR** | |
| **Q.4** | **(a)** | Explain turning point algorithm with suitable example. | **07** |
| | **(b)** | Design LPF with following specifications, Pass band frequency 0 to 5 KHz, sampling frequency 18KHz, and filter length 9. Obtain filter coefficients using frequency sampling method. | **07** |
| **Q.5** | **(a)** | Explain all stages of PAN and TOMPKINS algorithm for QRS detections | **07** |
| | **(b)** | Enlist and Explain signal conversions characteristics. | **07** |
| | | **OR** | |
| **Q.5** | **(a)** | Write a short note on ECG interpretation system. | **07** |
| | **(b)** | Explain convolution and correlation properties of Z transform | **07** |

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