

GUJARAT TECHNOLOGICAL UNIVERSITY**ME Semester –I Examination Feb. - 2012****Subject code: 713101N****Date: 11/02/2012****Subject Name: Medical System Design****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) Derive the equation of input impedance for the inverting and non inverting amplifier. **08**
- (b) Design a voltage to frequency converter that generates frequency 0 to 5 KHz corresponding to input voltage 10V. (Assume suitable data). **06**
- Q.2** (a) Design an Integrator that can remove DC offset from an AC signal. **07**
- (b) Write a short note on Auto zero amplifier and explain its applications. **07**
- OR**
- (b) Design a voltage controlled current source for grounded loads. **07**
- Q.3** (a) Explain sample and Hold circuit. Describe its important characteristics. **07**
- (b) Design a 3 bit flash type ADC and explain its working. **07**
- OR**
- Q.3** (a) Explain different types of error in DACs. **07**
- (b) Design and Explain the signal conditioning circuit for an RTD. **07**
- Q.4** (a) Explain measurement of force with interfacing circuits. **07**
- (b) Explain Capacitive level sensors with necessary sketches and derivations. **07**
- OR**
- Q.4** (a) Explain electromagnetic flow meter with neat block diagram. **07**
- (b) Explain measurement of Torque with interfacing circuit. **07**
- Q.5** (a) Design 4th order Butterworth high pass filter using the Sallen-key configuration. The filter must meet the following specifications: gain of the filter $A_{HPF}=1$ and 3 dB cut off frequency $f_c= 668\text{Hz}$. **08**
- (b) Explain measurement of conductivity with necessary diagram. **06**
- OR**
- Q.5** Design a Butterworth low pass filter using Sallen Key configuration for the following specification: **14**
- The stop band attenuation: 54dB
- The pass band attenuation: 3 dB
- Overall gain: unity
- f_c : 10Khz, the stop band frequency $f_s= 20\text{KHz}$.
- Compute the 3 dB cutoff frequency and quality factor of individual filter.

Table 1 factor of Butterworth polynomials

n	Normalised Denominator Polynomials in Factored Form
1	$(1+s)$
2	$(1+1.414s+s^2)$
3	$(1+s)(1+s+s^2)$
4	$(1+0.765s+s^2)(1+1.848s+s^2)$
5	$(1+s)(1+0.618s+s^2)(1+1.618s+s^2)$
6	$(1+0.518s+s^2)(1+1.414s+s^2)(1+1.932s+s^2)$
7	$(1+s)(1+0.445s+s^2)(1+1.247s+s^2)(1+1.802s+s^2)$
8	$(1+0.390s+s^2)(1+1.111s+s^2)(1+1.663s+s^2)(1+1.962s+s^2)$
9	$(1+s)(1+0.347s+s^2)(1+s+s^2)(1+1.532s+s^2)(1+1.879s+s^2)$
10	$(1+0.313s+s^2)(1+0.908s+s^2)(1+1.414s+s^2)(1+1.782s+s^2)(1+1.975s+s^2)$