Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – I • EXAMINATION – WINTER 2012

Subject code: 713101N **Date: 08-01-2013**

Subject Name: Medical System Design

Time: 02.30 pm – 05.00 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 total output offset Voltage e_0 Operational Amplifier and describe its significance in Medical System Design. **07**

$$e_0 = (1+(R2/R1))e_{os} - I_{off} R2$$

Where e_{os} = Input offset Voltage, Ioff = Input Offset Current, R1= Input resistor, R2 = Feedback Resistor

(b) Explain Voltage to Frequency converter with neat circuit diagram and derive its equation of output frequency. **07**

Q.2 **(a)** Explain frequency response of the Integrator circuit, also draw and explain circuit of Integrator for Separation of the DC offset from AC signals. **07**

(b) Explain SVRR. A type 741 op-amp has Power supply rejection ratio of 150µV/V (maximum). It is utilized as a non inverting amplifier with a closed loop gain Acl = 100. There is 1.5 Vpp (Peak to peak) ripple on the positive supply and a 0.9Vpp (Peak to peak) ripple on the negative supply. Determine the error output voltage. **07**

OR

(b) Explain CMRR. A type 741 operational amplifier has the following parameters: CMRR = 70 dB (min.) at zero frequency, Corner frequency of the CMRR is f_{cm} = 200Hz. Determine the CMRR of the amplifier with R1 = 1KΩ, and R2 = 100KΩ at the operating frequency f = 1 KHz in dB and mV. Find the output voltage for the input voltage e_s = 2 V. **07**

Q.3 **(a)** Explain Voltage controlled Current Source with grounded load with necessary derivation and describe its significance in design with example. **07**

(b) Explain Frequency to Voltage Converter. **07**

OR

Q.3 **(a)** Explain Auto Zero amplifier with circuit diagram, describe its significance in design. **07**

(b) Design 4th order Butter worth 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 fc = 668 Hz. Consider coefficient a1 = 0.76536686 and a2 = 1.84775907 **07**

Q.4 **(a)** Explain Sample and Hold circuit with feedback and also discuss about maximum allowable frequency. **07**

(b) Design using Analog multiplexer Software programmable Gain Amplifier with gain of 1, 2, 5, 10, 20, 50, 100 and 200. **07**

OR

Q.4	**(a)**	Explain 3 bit Flash type Analog to Digital Converter with its merits and demerits.	**07**
	(b)	Explain Dual slope Analog to Digital Converter and also explain bipolar operation of the Dual slope ADC.	**07**
Q.5	**(a)**	Explain 5 bit Anti logarithmic type Digital to Analog converter.	**07**
	(b)	Explain 4 bit Voltage segment Digital to Analog converter.	**07**

OR

Q.5	**(a)**	Explain Pipe line Analog to Digital converter.	**07**
	(b)	Derive the equation for Instrumentation Amplifier; discuss its significance with example.	**07**

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