Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – I • EXAMINATION – WINTER • 2013

Subject code: 713101N **Date: 23-12-2013**

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)**	Design a rectifier for a power supply of 30V/2A using transistorized series pass element based linear voltage regulator with short circuit protection.	**14**
Q.2	**(a)**	Prove that " Inverting amplifier though commonly applied as a voltage in voltage out circuit, when analyzed as negative feedback system is more properly treated as current in voltage out circuit".	**07**
	(b)	What is voltage to current converter? Explain how floating load converters are useful as V to I converter.	**07**
		OR	
	(b)	Describe grounded load V-I converter. Show the effects of resistance mismatch.	**07**
Q.3	**(a)**	Explain dual op-amp instrumentation amplifier (IA). Compare its performance with triple op-amp IA.	**07**
	(b)	Design a 4th order Butterworth high pass filter using the sallen-key configuration. The filter must meet the following specification: gain A_{HPF}=1 and 3 dB cut off frequency f_c=668Hz. Butterworth polynomials a_1=0.76536686, a_2=1.84775907	**07**
		OR	
Q.3	**(a)**	Design a digitally programmable IA having an overall gain of 1V/V, 10 V/V, 100V/V, 1000V/V. Show the final design.	**07**
	(b)	Design a Butterworth low pass filter using Sallen-key configuration. The filter must meet the following specifications: the stop band attenuation A_{min}= 54 dB, The pass band attenuation A_{max}= 3 dB. The passband frequency where attenuation is A_{max} f_c= 10KHz. The stop band frequency f_s=20KHz. Overall gain is unity. Butterworth polynomials a_1=0.34729636, a_2=1, a_3=1.23208889, a_4=1.78201305	**07**
Q.4	**(a)**	Explain the effect of finite GBP on integrator circuit. Draw circuit for passive and active compensation for integrators.	**07**
	(b)	Describe the peak detector circuits.	**07**
		OR	
Q.4	**(a)**	Explain auto zero and chopper stabilized op-amp circuits.	**07**
	(b)	Explain the precision full wave rectifier with necessary circuit diagram.	**07**
Q.5	**(a)**	Explain the band gap voltage reference.	**07**
	(b)	Write a short note on performance specifications fo DAC and ADC	**07**
		OR	
Q.5	**(a)**	Explain power supply supervisory circuit and how OV/UV sensing and line loss detection is performed.	**07**
	(b)	Write a short note on $\sum$ - Δ ADC.	**07**

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