Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV (NEW) - EXAMINATION – SUMMER 2018

Subject Code:2141002 Date:17/05/2018

Subject Name:Analog Circuit Design

Time:10:30 AM to 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)**	Define the following parameters of Op-Amp: (i) Slew Rate (ii) Common Mode Rejection Ratio. (iii) PSRR	**03**
	(b)	Draw Hybrid - π equivalent circuit for CE transistor. Also derive the equation of transconductance g_m.	**04**
	(c)	Explain application of op-amp (Inverting configuration) as summing, scaling and averaging circuit.	**07**
Q.2	**(a)**	Sketch equivalent circuit of crystal and discuss its application in oscillator circuit. Draw crystal based oscillator circuit.	**03**
	(b)	Design RC phase oscillator for the frequency of 3KHz.	**04**
	(c)	What is an oscillator? Explain the concept of oscillation with Barkhausen criteria.	**07**
		OR	
	(c)	Draw op-amp based Wien-bridge oscillator circuit and obtain its frequency of oscillation.	**07**
Q.3	**(a)**	List out characteristics of ideal op-amp.	**03**
	(b)	Draw BJT based emitter coupled differential amplifier circuit. How can we improve its CMMR?	**04**
	(c)	Draw peaking amplifier. Specify the value of all components to provide a gain of 10 at a peak frequency of 16 KHz. Take L = 10mH with internal resistance of 30 Ω.	**07**
		OR	
Q.3	**(a)**	What are the problems associated with op-amp based basic differentiator circuit? Suggest possible solution.	**03**
	(b)	Explain the requirement of Instrumentation amplifier.	**04**
	(c)	Explain the operation of op-amp based sample and hold circuit and state its application.	**07**
Q.4	**(a)**	What is thermal drift? How does it affect the performance of an op-amp circuit?	**03**
	(b)	Define and explain the 'Lock range' and 'Capture range'.	**04**
	(c)	Design a free running ramp generator using IC 555 for V_{cc}=10V, C= 0.1µF and period T = 2ms. Take transistor with ß = 100. Explain its working.	**07**
		OR	
Q.4	**(a)**	What do you understand by precision rectifier? Draw half wave precision rectifier circuit.	**03**
	(b)	Sketch the circuit of FM detector using PLL and explain its working.	**04**
	(c)	Design an astable multivibrator using IC555 with repetition frequency of 1KHz and duty cycle 70%. Assume C=0.1µF. Draw designed Circuit and waveforms.	**07**
Q.5	**(a)**	Explain zero crossing detector with circuit diagram and waveforms.	**03**

	(b)	State the advantages and disadvantages of SMPS.	**04**
	(c)	Design a Delyiannis-Friend circuit with f_0 = 12.5KHz, Q=10 and mid band gain H =26dB.	**07**

OR

Q.5	**(a)**	Discuss magnitude scaling and frequency scaling in filter design.	**03**
	(b)	Comparison of linear and switching mode regulators.	**04**
	(c)	Design a 1.5KHz low pass second order Butterworth filter, Use the Sallen and Key equal component model. Assume the damping factor to be $\sqrt{2}$.	**07**

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