GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–IV (NEW) EXAMINATION – SUMMER 2024

Subject Code:2141002   **Date:15-07-2024**

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.**
4. **Simple and non-programmable scientific calculators are allowed.**

Q.1	**(a)**	Draw and explain block diagram of an op-amp.	**03**
	(b)	Draw Hybrid-π equivalent circuit for CE transistor. Also derive the equation of transconductance g_m.	**04**
	(c)	What is an oscillator? Explain the concept of oscillation with Barkhausen criteria.	**07**
Q.2	**(a)**	Define following terms : (1) CMRR (2) Input Bias Current (3) Input Offset Current	**03**
	(b)	Explain the characteristics of ideal op-amp.	**04**
	(c)	Draw and explain with necessary figure the single stage CE amplifier response. Also explain the significance of Gain Bandwidth product.	**07**
		OR	
	(c)	Explain application of an op-amp as summing, scaling and averaging amplifier (Inverting configuration).	**07**
Q.3	**(a)**	Draw and explain voltage transfer characteristics of an op-amp.	**03**
	(b)	Draw BJT based emitter coupled differential amplifier circuit. How can we improve its CMRR?	**04**
	(c)	Draw and explain op-amp based wien-bridge oscillator circuit and obtain frequency of oscillator.	**07**
		OR	
Q.3	**(a)**	What is thermal drift? How does it affect the performance of an op-amp circuit?	**03**
	(b)	Explain Voltage to Current convertor using op-amp with ground load.	**04**
	(c)	Draw and explain voltage shunt feedback amplifier, also derive expression for Input resistance, Output resistance.	**07**
Q.4	**(a)**	Define slew rate of an op-amp. What are its causes?	**03**
	(b)	Explain operation of PLL with basic block diagram.	**04**
	(c)	Explain the basic differentiator using an op-amp. Obtain expression for output voltage with necessary waveforms.	**07**
		OR	
Q.4	**(a)**	What do you understand by precision rectifier? Draw half wave precision rectifier circuit.	**03**
	(b)	Draw and explain Schmitt trigger circuit.	**04**
	(c)	Explain with a neat diagram and waveforms, the operation of a monostable multivibrator using 555 timer.	**07**
Q.5	**(a)**	Explain zero crossing detector with circuit diagram and wave forms.	**03**
	(b)	Discuss magnitude scaling and frequency scaling in filter design.	**04**
	(c)	Show how Bi-quad circuit can be used as a universal filter.	**07**

Q.5 **(a)** Compare active and passive filter. **03**

(b) Compare linear ad switching mode regulators. **04**

(c) Draw Sallen and Key low pass filter circuit and obtain its transfer function. **07**

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