GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–IV EXAMINATION – SUMMER 2025

Subject Code:3141002   **Date:08-05-2025**
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)**	Explain internal block diagram of OP-AMP	03
	(b)	List ideal characteristics of OP-AMP.	04
	(c)	Define Slew rate, CMRR, SVRR, input offset voltage, input offset current, input bias current, offset adjustment range.	07
Q.2	**(a)**	What is Barkhusen's criteria for oscillation?	03
	(b)	What is PLL? Explain operation of PLL with basic blocks and mention any four applications of it in radio communication.	04
	(c)	Explain working of 555 timer based Monostabe multivibrator.	07
		OR	
	(c)	Explain working of 555 timer based A-stable multivibrator.	07
Q.3	**(a)**	Explain the concept of V to I converter with grounded load.	03
	(b)	Explain absolute wave circuit.	04
	(c)	Analyze second order butterworth high Pass filter. Draw its frequency response and state design procedure.	07
		OR	
Q.3	**(a)**	Explain the importance of All Pass filter.	03
	(b)	Explain the working of a Square wave generator using op-amp	04
	(c)	Analyze second order butterworth low Pass filter. Draw its frequency response and state design procedure	07
Q.4	**(a)**	Explain the concept of virtual ground in op-amp.	03
	(b)	Explain summing, scaling and averaging amplifier.	04
	(c)	What is need of clipper circuit? Explain op-amp as a positive and negative clipper along with necessary waveforms.	07
		OR	
Q.4	**(a)**	What is Voltage limiter circuit?	03
	(b)	Explain differential amplifier using two op-amps	04
	(c)	Explain how op-amp can be used to generate free running square wave with necessary circuit diagram and waveforms.	07
Q.5	**(a)**	Explain peak detector circuit.	03
	(b)	Derive relationship between hybrid π and h parameter	04
	(c)	Derive the high frequency trance conductance equation for g_m for CE amplifier.	07

OR

Q.5 (a) Explain gain bandwidth product. 03

(b) Derive the expression for gain in inverting and non-inverting configuration of OP-AMP. 04

(c) Derive high frequency current gain for CE amplifier with R_S. 07

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GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER– IV(NEW) EXAMINATION – SUMMER 2023
Subject Code:3141002   **Date:07-07-2023**
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.**

			MARKS
Q.1	**(a)**	Define PSRR, Slew Rate, and Output Offset voltage.	**03**
	(b)	Draw the schematic diagram of the OP-AMP and its equivalent circuit.	**04**
	(c)	Sketch the circuit of Phase-shift Oscillator using BJT and obtain its frequency of oscillation.	**07**
Q.2	**(a)**	Write short note on validity of hybrid-π model.	**03**
	(b)	List the parameter those affecting to the transistor at high frequencies.	**04**
	(c)	Derive the expression for the CE short-circuit current gain A_i as a function of frequency.	**07**
		OR	
	(c)	Explain in detail the working principle of a crystal oscillator.	**07**
Q.3	**(a)**	What is feedback in amplifiers? Compare and contrast the effects of negative and positive feedback on amplifier performance.	**03**
	(b)	With $g_m = 50$ mA/V, $r_{b'e} = 1$ K, $C_e = 1$ pF and $C_c = 0.2$ pF, determine the values of f_β and f_T.	**04**
	(c)	List and explain characteristics of amplifier which are modified by negative feedback.	**07**
		OR	
Q.3	**(a)**	The nominal gain (A_f) of an amplifier with feedback is 20, and a variation of 5% is permissible. If the magnitude of the return ratio ($A\beta$) is 1000, then determine the minimum value of the open loop gain (A) and the maximum permissible variation in it.	**03**
	(b)	Draw the four types of feedback amplifier topologies.	**04**
	(c)	Draw and explain triangular wave generator using OP-AMP	**07**
Q.4	**(a)**	What do you mean by Voltage regulator? List different types of voltage regulators.	**03**
	(b)	Sketch the OP-AMP based sample-and-hold circuit and explain its operation.	**04**

	(c)	Sketch and explain the operation of an A-stable multivibrator based on a 555 timer?	07

OR

Q.4	(a)	Briefly explain class A power amplifier.	03
	(b)	Draw block diagram of Phase Locked Loop (PLL) and briefly explain its working.	04
	(c)	Write a short-note on class-B push-pull power amplifier	07
Q.5	(a)	Explain the difference between a band-stop filter and a band-pass filter.	03
	(b)	With respect to filters define followings (i) Pass Band (ii) Stop Band (iii) Attenuation (iv) Cut-off frequency.	04
	(c)	Write a short-note on Transformer Coupled Audio Power Amplifier	07

OR

Q.5	(a)	555 based A-stable multivibrator is constructed using the following components: $C = 0.01\ \mu F$, $R_1 = 10K\Omega$, $R_2 = 50K\Omega$. Calculate the output frequency from the 555 oscillator and the duty cycle of the output waveform.	03
	(b)	How do active filters differ from passive filters? Briefly explain	04
	(c)	Explain in detail Sallen-Key second-order low-pass filter.	07

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GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER– IV(NEW) EXAMINATION – SUMMER 2023

Subject Code:3141002   **Date:07-07-2023**
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.**

			MARKS
Q.1	**(a)**	Define PSRR, Slew Rate, and Output Offset voltage.	**03**
	(b)	Draw the schematic diagram of the OP-AMP and its equivalent circuit.	**04**
	(c)	Sketch the circuit of Phase-shift Oscillator using BJT and obtain its frequency of oscillation.	**07**
Q.2	**(a)**	Write short note on validity of hybrid-π model.	**03**
	(b)	List the parameter those affecting to the transistor at high frequencies.	**04**
	(c)	Derive the expression for the CE short-circuit current gain A_i as a function of frequency.	**07**

<div align="center">OR</div>

	(c)	Explain in detail the working principle of a crystal oscillator.	**07**
Q.3	**(a)**	What is feedback in amplifiers? Compare and contrast the effects of negative and positive feedback on amplifier performance.	**03**
	(b)	With $g_m = 50$ mA/V, $r_{b'e} = 1$ K, $C_e = 1$ pF and $C_c = 0.2$ pF, determine the values of f_β and f_T.	**04**
	(c)	List and explain characteristics of amplifier which are modified by negative feedback.	**07**

<div align="center">OR</div>

Q.3	**(a)**	The nominal gain (A_f) of an amplifier with feedback is 20, and a variation of 5% is permissible. If the magnitude of the return ratio ($A\beta$) is 1000, then determine the minimum value of the open loop gain (A) and the maximum permissible variation in it.	**03**
	(b)	Draw the four types of feedback amplifier topologies.	**04**
	(c)	Draw and explain triangular wave generator using OP-AMP	**07**
Q.4	**(a)**	What do you mean by Voltage regulator? List different types of voltage regulators.	**03**
	(b)	Sketch the OP-AMP based sample-and-hold circuit and explain its operation.	**04**

	(c)	Sketch and explain the operation of an A-stable multivibrator based on a 555 timer?	**07**

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OR

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Q.4	**(a)**	Briefly explain class A power amplifier.	**03**
	(b)	Draw block diagram of Phase Locked Loop (PLL) and briefly explain its working.	**04**
	(c)	Write a short-note on class-B push-pull power amplifier	**07**

Q.5	**(a)**	Explain the difference between a band-stop filter and a band-pass filter.	**03**
	(b)	With respect to filters define followings (i) Pass Band (ii) Stop Band (iii) Attenuation (iv) Cut-off frequency.	**04**
	(c)	Write a short-note on Transformer Coupled Audio Power Amplifier	**07**

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OR

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Q.5	**(a)**	555 based A-stable multivibrator is constructed using the following components: $C = 0.01\ \mu F$, $R_1 = 10K\Omega$, $R_2 = 50K\Omega$. Calculate the output frequency from the 555 oscillator and the duty cycle of the output waveform.	**03**
	(b)	How do active filters differ from passive filters? Briefly explain	**04**
	(c)	Explain in detail Sallen-Key second-order low-pass filter.	**07**

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GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–IV (NEW) EXAMINATION – SUMMER 2022

Subject Code:3141002   **Date:23-06-2022**

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.**

			Marks
Q.1	**(a)**	List out characteristics of ideal op-amp.	**03**
	(b)	Define following terms. Slew Rate, CMRR, SVRR, I/P offset voltage.	**04**
	(c)	Explain the basic differentiator using an op-amp. What are the problems associated with this configuration? How they are overcome?	**07**
Q.2	**(a)**	Explain window detector using OP-AMP.	**03**
	(b)	Write a short-note on crystal oscillator.	**04**
	(c)	Derive the expression for the CE short-circuit current gain A_i as a function of frequency.	**07**
		OR	
	(c)	Explain working of 555 timer based A-stable multivibrator.	**07**
Q.3	**(a)**	Explain the concept of virtual ground in op-amp.	**03**
	(b)	Explain summing, scaling and averaging amplifier.	**04**
	(c)	Draw block diagram of Phase Locked Loop (PLL) and briefly explain its operation.	**07**
		OR	
Q.3	**(a)**	What are the advantages of the adjustable voltage regulators over the fixed voltage regulators?	**03**
	(b)	What is Voltage limiter circuit?	**04**
	(c)	Explain in detail Sallen-Key second-order low-pass filter.	**07**
Q.4	**(a)**	Define following terms. Lock Range for PLL, Capture Range for PLL, Frequency Stability for Oscillators.	**03**
	(b)	State the relation between hybrid-Π and h-parameters	**04**
	(c)	Draw the hybrid Π common emitter transistor model. Also derive the expression for transistor trans-conductance.	**07**
		OR	
Q.4	**(a)**	Discuss the difference between active and passive filter.	**03**
	(b)	Write a short-note on Advantages of negative feedback in amplifiers.	**04**
	(c)	Draw op-amp based wein bridge oscillator. Obtain frequency of oscillation and discuss amplitude stabilization for same.	**07**
Q.5	**(a)**	Explain differential amplifier using two op-amps	**03**
	(b)	Explain class A power amplifier	**04**
	(c)	Draw and explain square wave generator using OP-AMP.	**07**
		OR	
Q.5	**(a)**	Explain sample and hold circuit using OP-AMP.	**03**
	(b)	Explain peak detector using OP-AMP.	**04**
	(c)	Derive the high frequency trance conductance equation for g_m for CE amplifier.	**07**

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