Programme Name & Branch : B.Tech, ECE
Course Code and Course Name : Analog Circuits-BECE 206L
Faculty Name(s) : Dr. M. Jasmin Pemeena Priyadarisini, Dr. Deepika Rani Sona, Dr. P. Sathyanarayanan, Dr. Gautam Narayan, Dr. Veerapu Goutham, Dr. Sandhana Mahalingam M
Class Number(s) : VL2025260100478, VL2025260103560, VL2025260100474, VL2025260102659, VL2025260102656, VL202526010266
Date of Examination : 8.10.2025
Exam Duration : 90 minutes Maximum Marks: 50

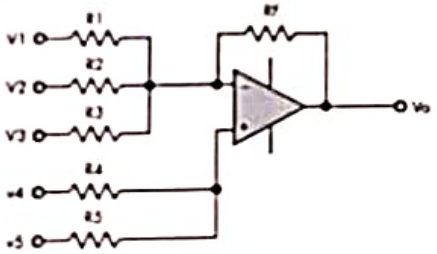
General instruction(s):

- Answer All Questions
- M - Max mark; CO – Course Outcome; BL – Blooms Taxonomy Level (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyse, 5 – Evaluate, 6 – Create)
- Course Outcomes

  3. To introduce MOSFET active biasing and design a MOSFET differential amplifier circuit and analyze its frequency response.

  4. To study the characteristics of Operational Amplifier and its applications

  5. To acquaint and demonstrate the concepts of waveform generators, filter configurations, Timer, data converters, and Voltage regulators.

Q. No	Question	M	CO	BL
1.	Consider a MOSFET differential pair, where $K_n = 0.8\ mA/V^2$, $V_A = 10V$, $V_{GS} = 2V$, $V_t = 0.7V$, $R_D = 10k\Omega$ and $R_{SS} = 14k\Omega$		3	3
	(a) Determine A_d and A_{cm} and CMRR in dB, if the output is taken single ended and circuit is properly matched.	10		
	(b) Determine A_d and A_{cm} and CMRR in dB, if the output is taken double ended.			
2.	(a) Given the op-amp summing amplifier circuit shown in Fig.1, with the following values: $V1 = 1\,V, V2 = 2\,V, V3 = -1\,V, V4 = 0.5\,V, V5 = -0.5\,V,$ $R1 = R2 = R3 = R4 = R5 = 10\,k\Omega$ and $RF = 20\,k\Omega$. Calculate the output voltage Vo.		4	3
	 Fig.1	4 + 6		
	(b) Design an ideal op-amp inverting integrator with an input resistance of 10 kΩ and an integration time constant of 10^{-3} s. What is the gain magnitude and phase angle of this circuit at 10 rad/s and at 1 rad/s?			

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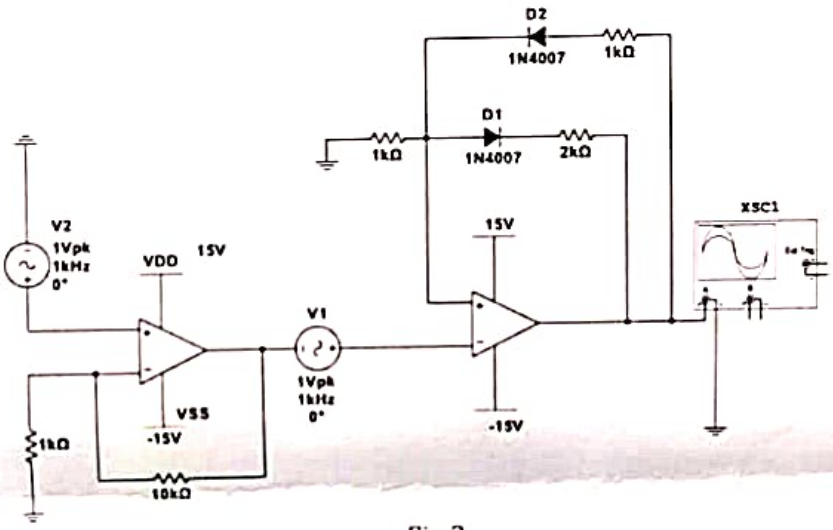
SLOT:D2+TD2

3.	(a) When a 15 $V_{p\text{-}p}$ square wave of 4.7 MHz frequency is the input to a voltage follower, the output is a triangular wave of 8 $V_{p\text{-}p}$. What is the slew rate of the op-amp? what should be the maximum frequency of the input signal to get an undistorted output if IC741 is used? (b) An op-amp has an input offset voltage drift of 0.3 μV/°C and an input offset current drift of 2pA/°C. The temperature increases from 25°C to 80°C and the source resistance at the input is 10 kΩ. Assume that V_O has been zeroed at 25°C and then the surrounding temperature is raised to 80°C. Find the maximum error in output voltage due to drift in input offset voltage and input offset current.	5 + 5	4	3
	Refer to the circuit shown in Fig. 2. Using the given parameters, determine the waveform that would appear on Oscilloscope Channel A. Calculate the output signal time period and the hysteresis voltage. Also, find the output voltage when V2 voltage source value is reduced to 0.1 mV sinωt. Consider OPAMP, diodes are ideal.  Fig.2	10	5	3
5.	Design and draw a Wien bridge oscillator using an op-amp to generate a sinusoidal output at 3.2 kHz. Choose $R_1 = R_2 = R$ and $C_1 = C_2 = C$. Given that the capacitors are C=3.8nF, calculate the resistor values R_1 and R_2 to achieve the desired frequency of oscillation. Also, calculate the required feedback resistor ratio R_3/R_4 to sustain oscillations with a minimum gain of 3.	10	5	3