U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

June 2025 Semester End Main Examinations

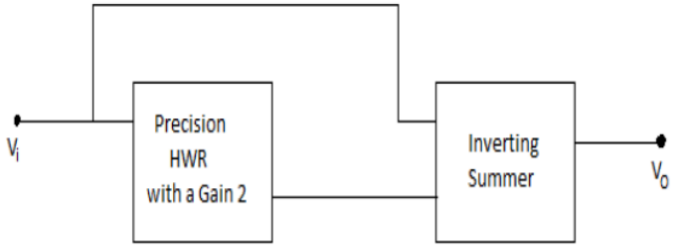
Programme: B.E. **Semester: IV**

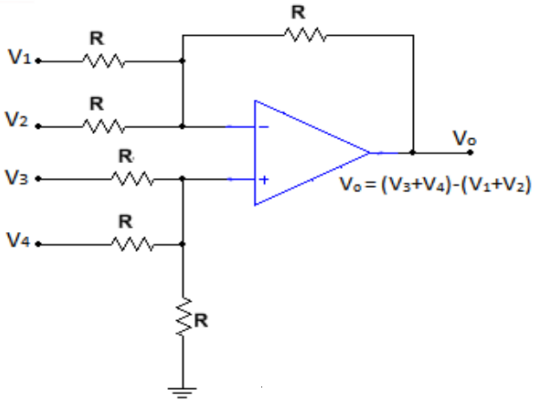
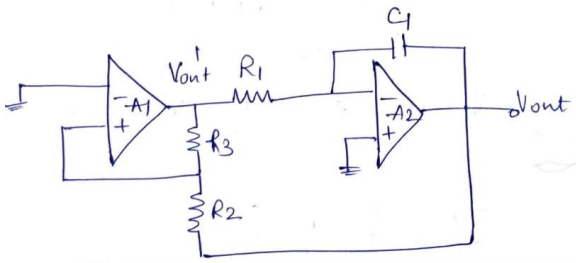
Branch: Electronics and Communication Engineering **Duration: 3 hrs.**

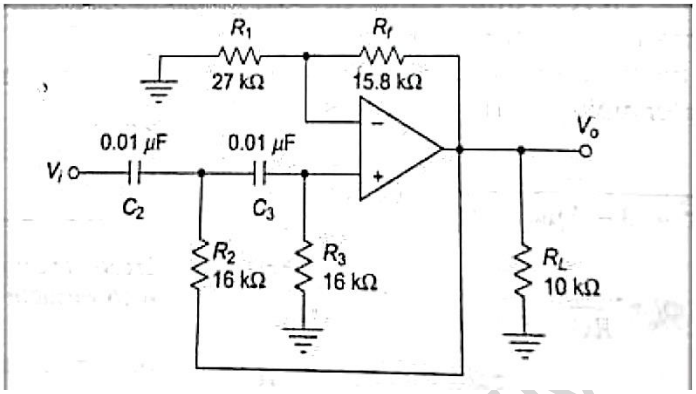
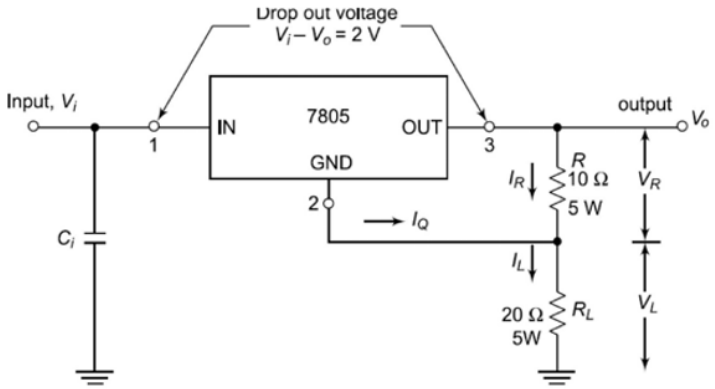
Course Code: 23EC4PCAIC **Max Marks: 100**

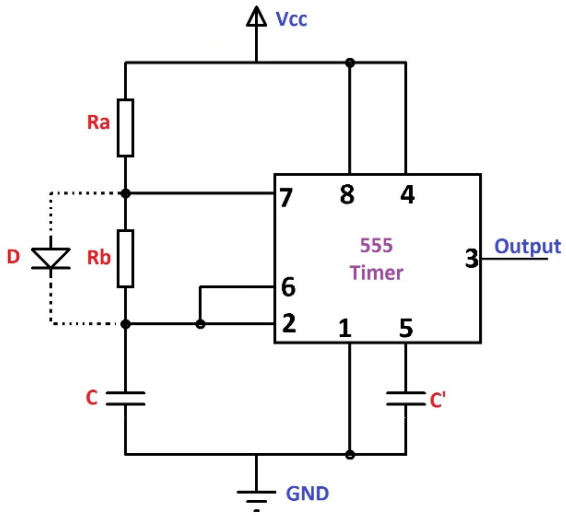
Course: Analog Integrated Circuits

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

		UNIT - I	*CO*	*PO*	Marks
1	a)	Explain the following parameters that specify the characteristics of typical op-amp 741: i) Input bias current ii) Input offset current iii) Input offset voltage	*1*		**6**
	b)	What are the advantages of Instrumentation amplifier over differential amplifier? Draw the circuit diagram and prove that the gain of the instrumentation amplifier is (1+2R'/R) times the differential gain.	*2*	*1*	**7**
	c)	Identify the following block diagram shown in figure 1c, write the circuit for the same and obtain the output equation and waveform.  figure 1c	*3*	*2*	**7**
		OR			
2	a)	Draw the circuit of a voltage to current converter and explain the working of the circuit if the load is i) floating and ii) grounded	*1*		**6**
	b)	Analyze the circuit shown in figure 2b and arrive at the equation for output voltage considering all resistors are same.	*3*	*2*	**6**

			 figure 2b			
		c)	Explain the external frequency compensation techniques with relevant equation and circuit diagram.	*1*		**8**
			UNIT - II			
	3	a)	Assume an input of V_{in}=6Sinωt and draw the output waveforms and transfer characteristics for the following circuits. (a) Inverting comparator with V_{ref}=+3V ,V_{ref}=-3V, V_{ref}=0V. (b) Non inverting comparator with V_{ref}=+3V ,V_{ref}=-3V, V_{ref}=0V	*2*	*1*	**7**
		b)	With a neat circuit diagram, explain the working of inverting Schmitt trigger along with input-output waveforms, transfer characteristics, when UTP=+2 V, LTP=-2V.	*2*	*1*	**7**
		c)	Explain simple op-amp as square wave generator with relevant waveforms.	*1*	-	**6**
			OR			
	4	a)	Construct the circuit that requires gain of 3 and R_F=2R_1 to produce sustained oscillations. Also derive the gain equation.	*2*	*1*	**10**
		b)	i)Illustrate the working of a wave generator circuit shown in figure 4b which produces an output waveform by integrating a square wave. ii)Assume that for the circuit R_1=100KΩ, R_2=10KΩ, R_3=20KΩ, C_1=0.01μF and ±V_{sat}=±14V for the op-amps. Determine a) Period b) Frequency c) Peak value of triangular wave  figure 4b	*3*	*2*	**10**
			UNIT - III			
	5	a)	Explain a regulated power supply using appropriate circuit.	*1*		**6**

		b)	With the diagram explain low voltage regulator using 723 IC	*1*		**7**
		c)	Design a 2nd order Butterworth low pass filter having upper cutoff frequency of 2KHz. Assume C=0.1 μF and α= 1.414.	*4*	*3*	**7**
			OR			
	6	a)	Explain how fixed regulator can be used as adjustable regulator.	*1*		**6**
		b)	Find the lower cut-off frequency f_L for the second order high-pass Butterworth filter shown in figure 6b. Also, find the passband gain of the filter and plot the frequency response of the filter.  Figure 6b	*2*	*1*	**7**
		c)	Using 7805 voltage regulator, design a current source to deliver 250 mA current to a 10 W, 3W load.  	*4*	*3*	**7**
			UNIT - IV			
	7	a)	With block diagram and an example explain the working of Successive approximation ADC.	*1*		**8**
		b)	A dual slope ADC uses a 16-bit counter and a 4 MHz clock rate. The maximum input voltage is +10V. The maximum integrator output voltage should be -8V when the counter has cycled through 2^n counts. The capacitor used in the integrator is 0.1μF. Find the value of the resistor R of the integrator.	*2*	*1*	**6**
		c)	What output voltage would be produced by a D/A converter whose output is 0 to 10V and whose input binary number is (i)10 (for a 2-bit D/A converter)	*2*	*1*	**6**

			(ii) 0110 (for a 4-bit DAC) (iii) 10111100 (for an 8-bit DAC)			
			OR			
	8	a)	With a neat circuit diagram and truth table, explain the working of binary weighted resistor DAC	*1*		**6**
		b)	An 8 bit ADC accepts an input voltage signal of range 0 to 10 V. a. What is the minimum value of input voltage required to generate a change of 1 LSB? b. What input voltage will generate all 1s at the A/D converter o/p? c. What is the digital output for an applied input voltage of 4.8V?	*2*	*1*	**7**
		c)	A counting ADC uses a 7bit DAC. The MSB of the output voltage is +5V. i) If analog input voltage is +6.85 V, what will be the R-2R ladder output voltage when the clock stops? ii) What is the number of clock pulses that occur between the release of reset and stopping of the clock?	*2*	*1*	**7**
			UNIT - V			
	9	a)	With a neat functional diagram and pin diagram explain the working of 555 monostable multivibrator. Draw the relevant waveforms.	*1*		**10**
		b)	Design an astable multivibrator using 555 timer IC to have 5kHz as the output frequency and also to have (a) D=60% (b) D=40%. Assume C=0.01µF.	*4*	*3*	**10**
			OR			
	10	a)	Explain with relevant block diagram the operation of IC 566 VCO.	*1*		**10**
		b)	Identify the circuit in figure 10b and show that with introduction of diode, how same circuit can be used for adjustable duty cycle with appropriate equations.  figure 10b	*3*	*2*	**10**

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