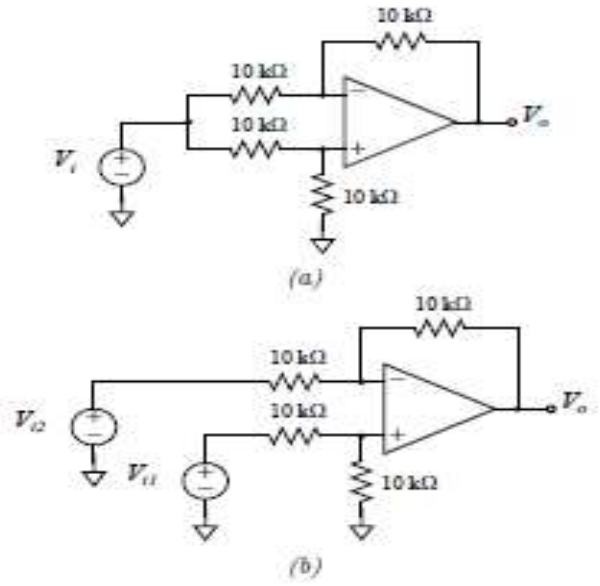
Name: **Enrolment No:**	UPES

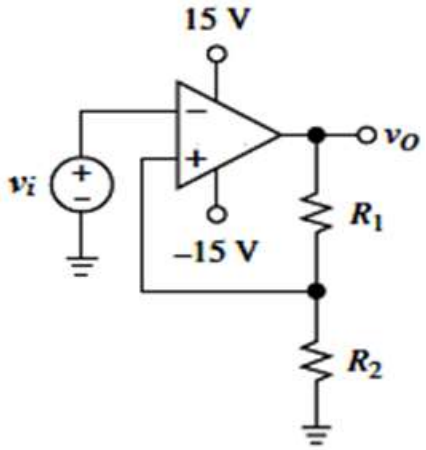
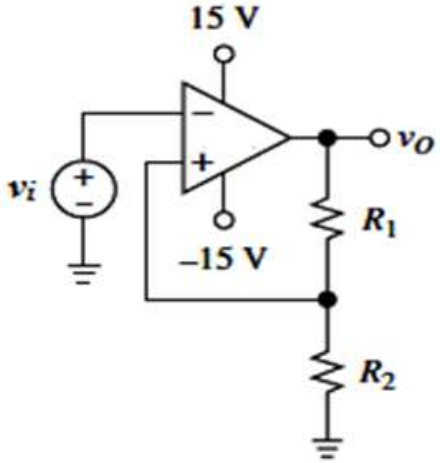
UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, May 2019

Programme Name: BT-EL **Semester : IV**
Course Name : Linear Integrated Circuits **Time : 02 hrs**
Course Code : ECEG 2008 **Max. Marks : 100**
Nos. of page(s) :02
Instructions:
All questions are compulsory.

SECTION A

S. No.		Marks	CO
Q1.	Determine V_{out} for the two connections shown in below **Figure 1**. Assume V_1 = 5V, V_a = 1V and V_b = 2V.  **Figure 1**	**5**	**CO2**
Q2.	Discuss why Schmitt trigger is also known as square wave generator.	**5**	**CO1**
Q3.	With neat block diagram, explain the operation of 8-bit successive approximation register type ADC. What is the maximum conversion time for this type of ADC.	**5**	**CO2**

Q4.	Write short notes on virtual ground concept.	**5**	**CO1**
	SECTION B		
Q5.	Show that the High pass RC network performs filtering and op-amp provides amplification?	**10**	**CO2**
Q6.	A regenerative comparator (Schmitt Trigger) circuit is shown in **Figure 2.** Derive expressions for upper threshold and lower threshold voltages, V_{UT} and V_{LT} respectively and hence the value of hysteresis voltage V_H. Calculate V_{UT}, V_{LT}, V_H for the given values of R_1 = 54 kΩ and R_2 = 2 kΩ.  **Figure 2**	**10**	**CO3**
Q7.	A sine wave with 4 V peak-to-peak amplitude and 2 kHz frequency is applied at the input of the circuit. Plot the input and output waveforms. Vcc = + 15 V  **Figure 3**	**10**	**CO3**
Q8.	A circuit whose output does not have any stable state and the Output has two Quasi-Stable states using op-amp to produce a square wave output where output keeps on changing its own from 1state to another state and Vice Versa. Design the circuit for above mentioned specifications.	**10**	**CO3**

	SECTION-C		
Q9	An astable multivibrator flashes the electric bulb such that its ON time will be 5 seconds and off time will be 3 seconds. Design the circuit diagram for the above mentioned specifications calculating: • Values for R_A and R_B. Assuming the value of capacitance in µF.	**20**	**CO4**
Q10	Design a timer, which should turn ON heater immediately after pressing a push button and should hold heater in 'ON-state' for 10 seconds.	**20**	**CO4**

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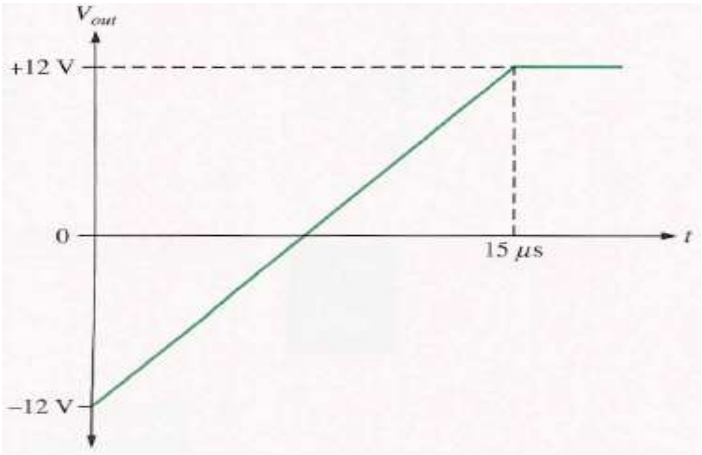
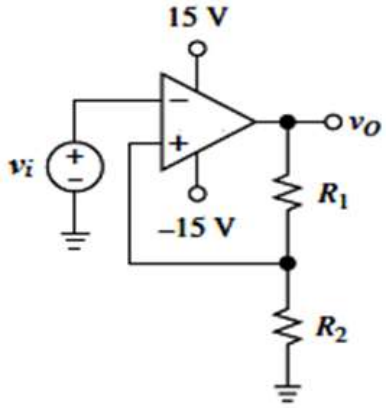
SECTION A

S. No.		Marks	CO
Q1.	A 555 timer is configured to run in astable mode with R_A = 4kΩ, R_B =4kΩ and C=0.01μF. Determine the frequency of the output and duty cycle.	**5**	**CO2**
Q2.	Discuss why Astable Multivibrator is also known as square wave generator.	**5**	**CO1**
Q3.	An op-amp has dc gain of 10^4 and a gain of 500 at a frequency of 1kHz. Calculate its break frequency and UGB (Unity Gain Bandwidth).	**5**	**CO2**
Q4.	Figure 1 shows the output voltage of an op-amp in response to the step input. Find the slew rate.  **Figure 1**	**5**	**CO1**

SECTION B

Q5.	With neat block diagram, explain the operation of 8-bit successive approximation register type ADC.	**10**	**CO3**
Q6.	A regenerative comparator (Schmitt Trigger) circuit is shown in **Figure 2**	**10**	**CO3**

	Derive expressions for upper threshold and lower threshold voltages, V_{UT} and V_{LT} respectively and hence the value of hysteresis voltage V_H. Calculate V_{UT}, V_{LT}, V_H for the given values of R_1 = 54 kΩ and R_2 = 4 kΩ.  **Figure 2**		
Q7.	Design a RC phase shift FET oscillators defining condition for sustained oscillations.	**10**	**CO3**
Q8.	Design a circuit using op-amp to produce a square wave whose output has one stable state and one quasi-stable state where circuit generates pulse output if trigger input is applied.	**10**	**CO3**
	SECTION-C		
Q9	Design a circuit diagram of an astable multivibrator to generate the output signal with frequency of 1kHz and the duty cycle of 75%. The design process should have (i) Well labelled waveforms (ii) Value of R_A & R_B. Assuming the value of capacitance in µF.	**20**	**CO4**
Q10	Design a 555 timer based square wave generator to produce a symmetrical square wave of 1kHz. If V_{cc} =12V, draw the voltage across timing capacitor and the output.	**20**	**CO4**