

Roll No.:.....

# National Institute of Technology, Delhi

Name of the Examination: B. Tech. / M. Tech. / Ph.D.

Branch : ECE & EEE

Semester : V

Title of the Course : IC Applications

Course Code : ECB 304

Time: 3 Hours

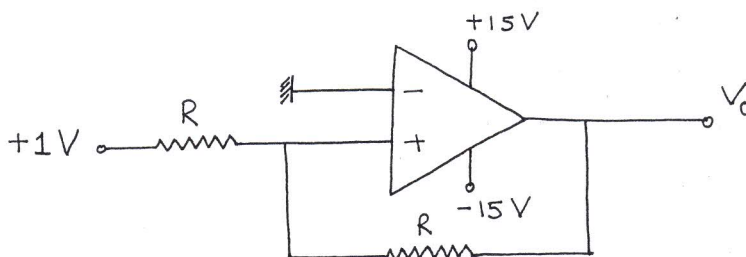
Maximum Marks: 50

## Guidelines:

1. The question paper is divided into three sections A, B and C and each section has following type of questions
  - a. Section A: Carry only one (01) question of 10 parts of 01 mark each and all parts are compulsory.
  - b. Section B: Contains Five (05) questions of 5 marks each and any four (04) are to be attempted.
  - c. Section C: Contains Three (03) questions of ten (10) marks each and any two (02) are to be attempted.

## SECTION A

- Q1. Draw and label the pin diagram of IC 741.
- Q2. Draw the ideal voltage transfer curve of an operational amplifier?
- Q3. Explain how an op-amp can be used as a voltage follower.
- Q4. Define Bark-Hausen criterion for oscillator.
- Q5. Define CMRR?
- Q6. Determine the output voltage,  $V_0$  for the given circuit.



Q7. Explain the operation of zero-crossing detector.

Q8. What is bias current?

Q9. What is gain-bandwidth product?

Q10. Draw the circuit for band reject filter.

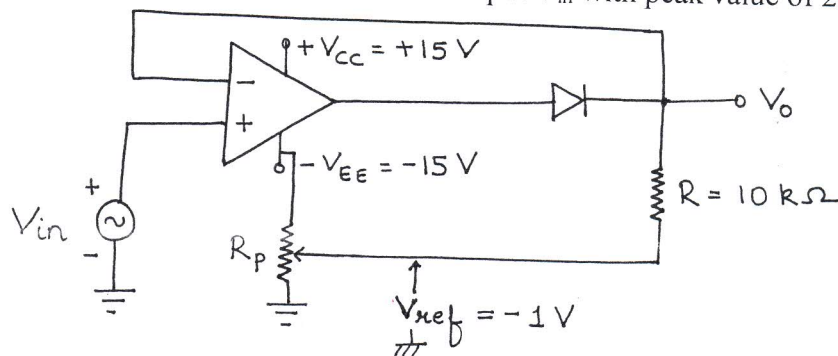
## SECTION B

Q1. Define Slew rate and also derive an expression for slew rate. An op-amp having a slew rate of  $62.8 \text{ V}/\mu\text{s}$  is connected in a voltage follower configuration. If the maximum amplitude of the input sinusoidal is  $10 \text{ V}$ , then find the minimum frequency at which the slew rate limited distortion would set in at the output.

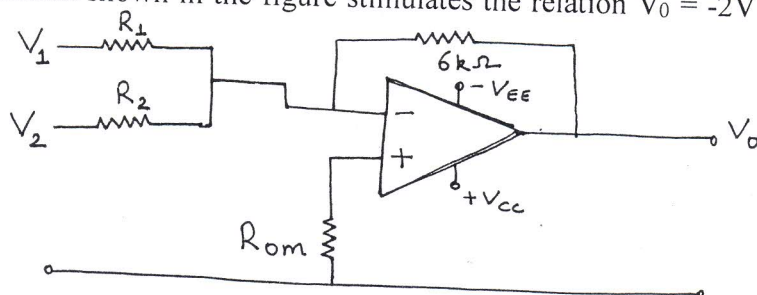
Q2. Draw the circuit diagram of a Wein bridge oscillator. Derive an expression for its frequency of oscillation.

Q3. Design a first order low pass filter having a cut-off frequency of  $1 \text{ KHz}$  and passband gain of 2. Also draw its frequency response.

Q4. Draw the output waveform for a sinusoidal input  $V_{in}$  with peak value of  $2 \text{ V}$ .



Q5. The circuit shown in the figure stimulates the relation  $V_0 = -2V_1 - 3V_2$ . Determine the values of  $R_1$  and  $R_2$ .

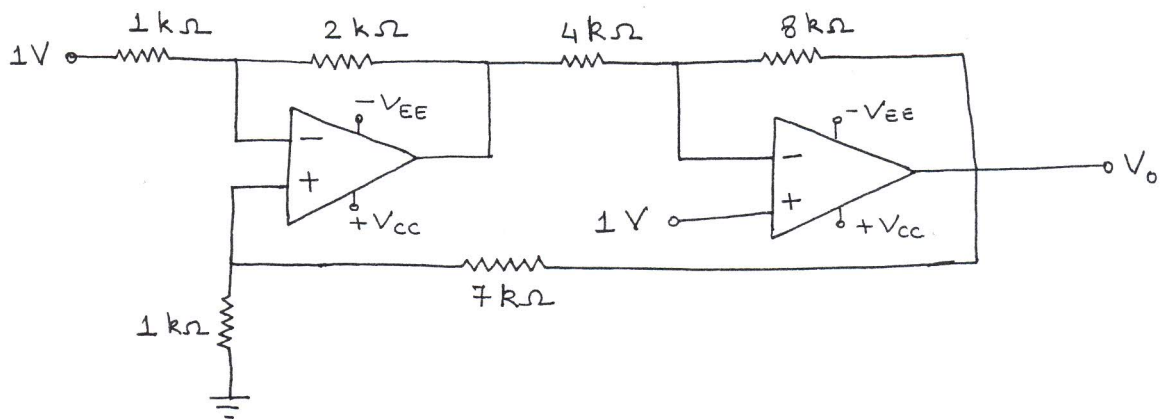


### SECTION C

Q1. Derive an expression for Hysteresis width in Schmitt Trigger. What is the importance of Hysteresis width? Draw the output waveform and transfer curve for a Schmitt Trigger if a sinusoidal wave is given at the input.

Q2. (a) Draw the block diagram of an operational amplifier. Explain the working of each block. [6 marks]

(b) Find the output voltage for the given circuit. [4 marks]



Q3. (a) Discuss the different Filter approximations for an analog filter design. How is the filter response improved by increasing the order of the filter? Discuss using Butterworth high pass Filter. [6 marks]

(b) Discuss positive clipper using an op-amp. Draw its output waveform if a sinusoidal wave is given at its output. [4 marks]