

**Fourth Semester B.E. Degree Examination, Feb./Mar. 2022**  
**Linear IC's And Applications**

Time: 3 hrs.

Max. Marks:100

- Note:** 1. Answer any FIVE full questions, selecting atleast TWO questions from each part  
 2. Use standard resistance and capacitance values.

**PART - A**

- 1 a. Explain the operation of Basic op-amp circuit. (08 Marks)  
 b. Sketch a typical gain versus frequency graph for an operational amplifier and explain. (06 Marks)  
 c. An op-amp non-inverting amplifier, shown in Fig Q1(c), has  $R_1 = 8.2K\Omega$  and  $R_2 = 150\Omega$ . Calculate the amplifier voltage gain, and determine a new resistance value for  $R_2$  to give a voltage gain of 75.

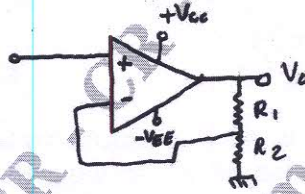


Fig Q1(c)

(06 Marks)

- 2 a. Sketch the circuit of a capacitor coupled inverting amplifier using single polarity supply. Briefly explain. (07 Marks)  
 b. The inverting amplifier shown in Fig Q2(b) is to be capacitor coupled and to have a signal frequency range of 10Hz to 1KHz. If the load resistor is  $250\Omega$ . Calculate the required capacitor values.

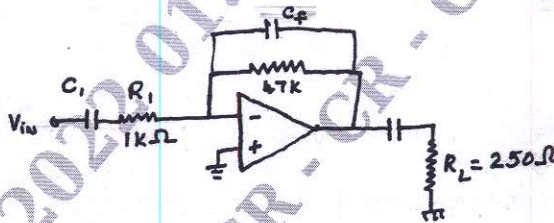


Fig Q2(b)

(06 Marks)

- c. Design a capacitor coupled voltage follower using a 741 operational amplifier. The lower cut of frequency for the circuit is to be 50Hz and the load resistance is  $R_L = 3.9K\Omega$ . (07 Marks)
- 3 a. List the precautions that should be observed for operational amplifier circuit stability. (07 Marks)  
 b. Explain why a low gain amplifier using an op-amp is more likely to be unstable than a high gain circuit. (08 Marks)  
 c. Calculate the slew rate limited cut-off frequency for a voltage follower circuit using a 741 op-amp if the peak of sine wave output is to be 5V. [Given typical slew rate for the 741 op-amp  $S = 0.5V/\mu s$ .] (05 Marks)



- 4 a. Sketch the circuit of a low – resistance voltage source using an op-amp and a bipolar transistor. Show how a potential divider or a zener diode may be used to determine the output voltage. (10 Marks)
- b. Design a non-saturating precision half-wave rectifier as shown in Fig Q4(b) to produce a 2V peak output from a sine wave input with a peak value of 0.5V and frequency of 1MHz. Use a bipolar op-amp with a supply voltage of  $\pm 15V$ .

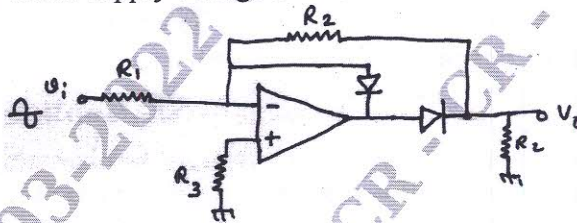


Fig Q4(b)

(10 Marks)

## PART – B

- 5 a. Sketch the circuit of a triangular/rectangular waveform generator. Draw the output waveforms from the circuit showing their phase relationship and carefully, explain the circuit operation. (10 Marks)
- b. Sketch the circuit diagram of a current to voltage converter and explain. (10 Marks)
- 6 a. A capacitor coupled zero crossing detector shown in Fig Q6(a) is to handle a 1KHz square wave input with a peak-to-peak amplitude of 6V. Design the values of  $R_1$ ,  $R_2$ ,  $R_3$  and  $C_1$ .

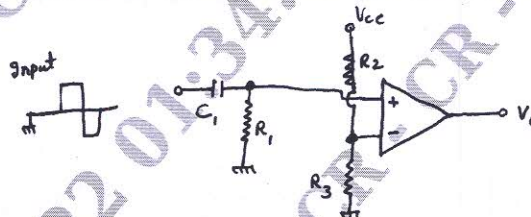


Fig Q6(a)

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- b. Draw an op-amp inverting Schmitt trigger circuit and explain its operation. (10 Marks)
- 7 a. Sketch the series op-amp regulator circuit diagram and explain the operation. (10 Marks)
- b. What is the principle of switch mode power supply? Discuss its advantages and disadvantages. (06 Marks)
- c. List the characteristics of three terminal IC regulators. (04 Marks)
- 8 a. Sketch the circuit diagram of a nonstable multivibrator using 555 timers and explain the operation with necessary waveforms. (10 Marks)
- b. Draw the basic block schematic of the PLL and explain its operation. (10 Marks)

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