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10EC46

**Fourth Semester B.E. Degree Examination, Dec.2016/Jan.2017**

**Linear ICs and Applications**

Time: 3 hrs.

Max. Marks:100

- Note: 1. Answer any FIVE full questions, selecting atleast TWO questions from each part.  
2. Use of standard resistor value and standard capacitor value table is allowed.**

**PART – A**

1.
  - a. Define the following terms with respect to opamp and specify their typical values for a 741 opamp:
    - i) CMRR
    - ii) PSRR
    - iii) Slew Rate. (06 Marks)
  - b. Derive an expression for the output voltage of non-inverting summing circuit. (07 Marks)
  - c. The difference of two input signals is to be amplified by a factor of 37. Each input has an amplitude of approximately 50 mV. Using LF353 opamp, design a difference amplifier to obtain approximately equal input resistance at the two input terminals and also provide common mode nulling. (07 Marks)
2.
  - a. Using a BIFET opamp, design a capacitor coupled inverting amplifier with an input signal of 30 mV, a load resistance of 2.2 k $\Omega$ ,  $A_V = 150$  and  $f_l = 80$  Hz. (05 Marks)
  - b. A high input impedance capacitor coupled non-inverting amplifier is to be designed using 741 opamp with  $A_V = 120$ ,  $f_l = 100$  Hz, input signal of 50 mV, and the load resistance ranging from 2.7 k $\Omega$  to 27 k $\Omega$ . (09 Marks)
  - c. Using 741 opamp with maximum input bias current of 500 nA, design a capacitor coupled voltage follower with a lower cutoff frequency of 120 Hz, and load resistance of 8.2 k $\Omega$  using +30V power supply. (06 Marks)
3.
  - a. Discuss about the conditions that have to be fulfilled for an opamp circuit to oscillate. (05 Marks)
  - b. With the help of circuit schematic and frequency response, explain how phase lag compensation can be used to stabilize opamp circuit. (05 Marks)
  - c. Mention the need for  $Z_{in}$  MOD compensation. Discuss the role of compensating components in  $Z_{in}$  MOD compensation for an inverting amplifier. (05 Marks)
  - d. List the precautions to be observed for opamp circuit stability. (05 Marks)
4.
  - a. Design a low resistance voltage source (with reference voltage derived from potential divider) to provide an output voltage of 8V. A 741 opamp with a  $\pm 15V$  supply is to be used, and the maximum output current is to be 60 mA. (08 Marks)
  - b. Determine the range of resistance of externally connected resistor  $R_G$  for a LH0036 IC instrumentation amplifier to give a voltage gain adjustable from 30 to 300. (03 Marks)
  - c. Design a precision full wave rectifier consisting of a summing circuit and a precision half wave rectifier to produce a 2V peak output from a sine wave input with peak value of 0.5 V and frequency of 1 MHz. Use bipolar opamps with a supply voltage of  $\pm 15V$ . (09 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Use of calculator and/or equations written eg,  $42+8 = 50$ , will be treated as malpractice.

**PART – B**

- 5 a. A  $\pm 5V$ , 10 kHz square wave from a signal source with a resistance of  $100 \Omega$  is to have its positive peak clamped precisely at ground level. Tilt on the output is not to exceed 1% of the peak amplitude of the wave. Design the precision clamping circuit using a supply of  $\pm 12V$ . (08 Marks)
- b. Draw the fundamental circuit of logarithmic amplifier and derive an expression for output voltage. (06 Marks)
- c. Design a wein bridge oscillator to have an output frequency of 15 kHz using a BIFET opamp with a supply voltage of  $\pm 12V$ . (06 Marks)
- 6 a. With a neat circuit diagram and associated waveforms explain the working principle of inverting Schmitt trigger circuit. (05 Marks)
- b. Explain the working principle of astable multivibrator with a neat circuit schematic and waveforms. Specify the design procedure for this circuit. (09 Marks)
- c. Using a 741 opamp, design a second order low pass filter with a cutoff frequency of 1 kHz. (06 Marks)
- 7 a. Discuss about the important characteristics of three terminal IC regulator. (04 Marks)
- b. Draw the functional block diagram of IC723 voltage regulator and explain. (06 Marks)
- c. With the help of circuit schematic explain the principle of operation of switched mode power supply. Mention its advantages. (10 Marks)
- 8 a. Draw the circuit diagram of monostable multivibrator using IC 555 and derive the expression for output pulse width. (05 Marks)
- b. Give the basic block schematic of PLL and explain the function of each block. (06 Marks)
- c. Draw the functional diagram of dual slope ADC and explain its working principle. Mention its advantages and limitations. (09 Marks)

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