



# CBCS SCHEME

15EC46

## Fourth Semester B.E. Degree Examination, Aug./Sept. 2020 Linear Integrated Circuits

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

### Module-1

- 1 a. Explain the working of a basic operational amplifier, circuit with  $R_C = 6.8k\Omega$ ,  $R_E = 4.7k\Omega$  and powered by  $\pm 10V$  supply. (08 Marks)
- b. Solve direct coupled inverting amplifier to amplify a DC input of 150mV by a factor of 40 use a Bi-polar op-amp with  $I_{B(max)} = 500nA$ . (04 Marks)
- c. Define CMRR of an op-amp. If a non-inverting amplifier is having a gain of 100 with 95dB CMRR, calculate the common mode output ( $V_{0(cm)}$ ) for a common mode input ( $V_{i(cm)}$ ) of 2V. (04 Marks)

OR

- 2 a. Define the following op-amp parameters and mention their typical values for 1C741 :
  - i) Input voltage range
  - ii) PSRR
  - iii) Input offset voltage
  - iv) Slew rate. (08 Marks)
- b. With a neat circuit diagram, explain direct coupled non-inverting amplifier. (04 Marks)
- c. Two signals each ranging from 0.1V to 1V are to be summed using 741 op-amp. Design suitable inverting summing circuit. (04 Marks)

### Module-2

- 3 a. Explain the realization of a high  $Z_{in}$  capacitor coupled voltage follower for AC amplifier obtain the expression for  $Z_{in}$  of the circuit. (08 Marks)
- b. Solve precision voltage source to provide an output of 9V. The available supply is  $\pm 12V$ . Allow for approximately  $\pm 10\%$  tolerance on the zener diode voltage. Use 741 op-amp and  $I_{B(max)} = 500nA$ ,  $I_Z = 20mA$ . (08 Marks)

OR

- 4 a. Derive an expression for the differential gain of an instrumentation amplifier. (08 Marks)
- b. Design a capacitor coupled inverting amplifier for a gain of 50 and output voltage 2.5V,  $f_1 = 10Hz$ ,  $f_2 = 1KHz$ ,  $R_L = 250\Omega$ , use bipolar op-amp. (08 Marks)

### Module-3

- 5 a. Explain the working of a sample and hold circuit with signal control and output waveform. (06 Marks)
- b. Using a 741 op-amp with a supply of  $\pm 12V$  design an inverting Schmitt trigger circuit to have trigger points of  $\pm 2V$ . (04 Marks)
- c. With a neat sketch, explain the working Wein bridge oscillator circuit. (06 Marks)

OR

- 6 a. With a suitable derivation, explain logarithmic amplifier. (06 Marks)  
b. Design RC phase shift oscillator for a output frequency of 5KHz use  $\mu A741$  op-amp with  $\pm 15V$  supply and  $I_{B(max)} = 500nA$ . (05 Marks)  
c. With a neat circuit diagram, explain op-amp integrating circuit. (05 Marks)

**Module-4**

- 7 a. Sketch the circuit of a second order active high pass filter. Explain its working. (06 Marks)  
b. Mention the advantages of IC voltage regulators. Draw the functional diagram for IC723 regulator. Briefly explain the working. (10 Marks)

OR

- 8 a. What are the advantages of active filters over passive filters? (04 Marks)  
b. Explain the working of series voltage regulator with current limiting protection. (06 Marks)  
c. Design 2<sup>nd</sup> order low pass filter to have cutoff frequency of 1KHz. (06 Marks)

**Module-5**

- 9 Explain the following with neat circuit diagrams and waveforms.  
a. PLL (08 Marks)  
b. 555 timer as Astable Multivibrator. (08 Marks)

OR

- 10 Explain the following with neat circuit diagrams and wave forms.  
a. 566 voltage controlled oscillator (08 Marks)  
b. Successive approximation ADC. (08 Marks)

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