

# CBCS SCHEME

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15EC46

## Fourth Semester B.E. Degree Examination, June/July 2018 Linear Integrated Circuits

Time: 3 hrs.

Max. Marks: 80

- Note: 1. Answer FIVE full questions, choosing one full question from each module.  
2. Use of standard resistor value and standard capacitor value table is allowed.

### Module-1

- 1 a. With neat circuit diagram, explain basic op-amp circuit. (06 Marks)  
b. Sketch an op-amp difference amplifier circuit. Derive an equation for output voltage and explain the operation. (05 Marks)  
c. A non inverting amplifier is to amplify a 100 mV signal to a level of 3 V. Using 741 op-amp design a suitable circuit. (05 Marks)

OR

- 2 a. Define following terms with respect to op-amp and mention their typical values:  
(i) PSRR (ii) CMRR (iii) Slew rate. (06 Marks)  
b. With neat circuit diagram, explain the operation of a direct coupled inverting amplifier with necessary design steps. (04 Marks)  
c. Obtain the expression for the three input inverting summing amplifier circuit and show how it can be converted into averaging circuit. (06 Marks)

### Module-2

- 3 a. Sketch and explain high  $z_{in}$  capacitor coupled voltage follower with necessary design steps and show that the input impedance is very high as compared to capacitor coupled voltage follower. (08 Marks)  
b. What are the advantages of precision rectifier over ordinary rectifier? Discuss the operation of precision full wave rectifier circuit using bipolar op-amp. (08 Marks)

OR

- 4 a. Draw the circuit diagram of instrumentation amplifier and explain its operation. Also show how voltage gain can be varied. (08 Marks)  
b. A capacitor coupled non-inverting amplifier is to have  $A_V = 100$  and  $V_0 = 5$  V with  $R_L = 10$  K $\Omega$  and  $f_1 = 100$  Hz. Design a suitable circuit using 741 op-amp. (08 Marks)

### Module-3

- 5 a. Draw and explain the operation of sample and hold circuit with signal, control and output waveforms. (08 Marks)  
b. Using 741 op-amp with a supply of  $\pm 12$ V, design a phase shift oscillator to have an output frequency of 3.5 kHz and voltage gain of 29. ( $A_V = 29$ ) (08 Marks)

OR

- 6 a. With neat circuit diagram explain the working of precision clipping circuit, with necessary waveforms. (08 Marks)  
b. With neat circuit diagram, explain the operation of inverting Schmitt trigger circuit. Draw the output waveforms and discuss the design procedure. (08 Marks)

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

**Module-4**

- 7 a. Draw the internal schematic for 723 IC low voltage regulator and explain its working and also mention the advantages of IC voltage regulators. (08 Marks)
- b. Design and explain the operation of second order active low pass filter. Using 741 op-amp to have a cut-off frequency of 2 kHz. (08 Marks)

**OR**

- 8 a. Show how a band pass filter can be constructed by the use of a low pass filter and a high pass filter. Sketch the expected frequency response and explain the operation of a single stage Band Pass Filter. (08 Marks)
- b. Discuss the important characteristics of a three terminal IC regulator and design a 7805 IC regulator to get the output voltage of 7.5 V (Choose  $I_Q = 4.2 \text{ mA}$ ,  $I_{R1} = 25 \text{ mA}$ ) (08 Marks)

**Module-5**

- 9 a. With the help of neat block diagram, explain the operation of Phase – Locked Loop (PLL) and define  
(i) Lock-in range (ii) Capture range (iii) Pull-in time (08 Marks)
- b. Explain the working of successive approximation Analog-to Digital Converter (ADC). (08 Marks)

**OR**

- 10 a. Draw the internal schematic of 555 timer IC and configure it for monostable operation and explain its working with necessary equations. (08 Marks)
- b. Explain the working of R-2R network D-A converter and derive expression for output voltage. (08 Marks)

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