CBCS SCHEME

USN | | | | | | | | | | |

15EC46

Fourth Semester B.E. Degree Examination, June/July 2023
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 basic circuit of operational amplifier. **(08 Marks)**

b. Sketch an illustration to show the effect of op-amp slew rate and explain. **(04 Marks)**

c. Define the following op-amp parameters and write their typical values for op-amp 741 :
(i) CMRR (ii) PSRR **(04 Marks)**

OR

2 a. Design a non-inverting amplifier to provide a gain of 100 for an input of 50 mV. Draw the circuit diagram of the same. Use op-amp 741. I_{Bmax} = 500 nA **(08 Marks)**

b. Sketch an op-amp difference amplifier circuit. Derive an equation for the output voltage and explain the operation. **(08 Marks)**

Module-2

3 a. Explain the operation of a high Z_{in} voltage follower based AC amplifier. Prove that its Z_{in} is very large, ideally. **(08 Marks)**

b. Using a LF 353 BIFET op-amp design a high Z_{in} capacitor coupled non inverting amplifier to have a low cut off frequency of 200 Hz. The input and output voltages are 15 mV and 3 V respectively. The minimum load resistance is 12 KΩ. Draw the circuit diagram. **(08 Marks)**

OR

4 a. Using op-amp 741, design a constant voltage source to provide 6 V. The load resistance is 100 Ω and the available supply voltage is ±12V . Use zener diode IN.753 transistor 2N 718, V_2 = 6.3 V, I_2 = 20 mA, $h_{fe(min)}$ = 20 **(08 Marks)**

b. Sketch the complete circuit of an instrumentation amplifier and explain its operation. **(08 Marks)**

Module-3

5 a. Draw the op-amp sample and hold circuit and explain its operation with relevant waveforms. **(08 Marks)**

b. Using a 741 op-amp with a supply of ± 12 V, design a RC phase shift oscillator to have an output frequency of 3.5 kHz. $I_{B(max)}$ = 500 nA ($A_V \geq 29$) **(08 Marks)**

OR

6 a. Sketch the circuit of a capacitor coupled zero-crossing detector. Show the waveforms at various points in the circuit and explain its operation. **(08 Marks)**

b. Draw the circuit diagram of logarithmic amplifier. Derive the expression for output voltage. **(08 Marks)**

Module-4

7 a. Design a second order low pass filter using op-amp 741, for a cut off frequency of 2 kHz. Draw the circuit diagram. $I_{B(max)} = 500$ nA **(08 Marks)**

b. Using 741, op-amp, design a single stage bandpass filter for a center frequency of 2 kHz and the pass band is to be approximately ± 100 Hz on each side of 2 kHz. ($I_{B(max)} = 500$ nA). **(08 Marks)**

OR

8 a. With neat diagram, explain the working of series op-amp regulator. **(08 Marks)**

b. Design a voltage regulator using IC723 to get a O/P voltage of 5 V. Draw the circuit diagram. **(08 Marks)**

Module-5

9 a. Draw the block diagram of PLL and explain it's operation. **(08 Marks)**

b. Briefly explain the working of 3-bit binary weighed DAC. **(08 Marks)**

OR

10 a. Explain 555 timer as monostable multivibrator with relevant circuit diagram and waveforms. **(08 Marks)**

b. For an astable multivibrator, given $R_A = 6.8\ K\Omega$, $R_B = 3.3\ K\Omega$, $C = 0.1\ \mu f$. Calculate

(i) t_{High}
(ii) t_{low}
(iii) Duty cycle
(iv) Free running frequency f.

Draw the circuit diagram. **(08 Marks)**

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