CBCS SCHEME

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15EC46

Fourth Semester B.E. Degree Examination, July/August 2022
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. Discuss the effect of using resistors that are too large at the input terminals of a bipolar op-amp. Write an equation for calculating a suitable, maximum resistance value. **(06 Marks)**

b. Using a 741 op-amp design a non-inverting amplifier to have a voltage gain of approximately 66. The signal amplitude is to be 15 mV. **(06 Marks)**

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

OR

2 a. Explain the method of dealing with input offset voltage and current. **(04 Marks)**

b. Design a inverting summing amplifier using 741 op-amp to give the direct sum of two inputs which each range from 0.1 V to 1 V. **(06 Marks)**

c. Derive the expression of $V_O = \frac{R_2}{R_1}(V_2 - V_1)$ of a difference amplifier. **(06 Marks)**

Module-2

3 a. Explain the operation of capacitor coupled voltage follower and also write the equations for calculating the capacitance values. **(06 Marks)**

b. A capacitor coupled non-inverting amplifier is to have a +24 V supply, a voltage gain of 100, an output amplitude of 5 V, a lower cutoff frequency of 75 Hz and a minimum load resistance of 5.6 KΩ. Using 741 op-amp, design a suitable circuits. **(08 Marks)**

c. What is the problem associated with voltage source using zener diode and how it can be solved? **(02 Marks)**

OR

4 a. Design an instrumentation amplifier to have an overall voltage gain of 900. The input signal amplitude of 15 mV and supply is ±15V. Use 741 op-amp. **(08 Marks)**

b. Draw the fullwave precision rectifier using summing circuit and a precision halfwave rectifier and explain it with necessary mathematical analysis. **(08 Marks)**

Module-3

5 a. Draw the op-amp sample and hold circuit. Sketch the signal, control and output waveforms. Explain the circuit operation. **(08 Marks)**

b. For the circuit shown in Fig. Q5 (b) is to handle a 1 kHz square wave input with a peak-to-peak amplitude of 6 V. Design a circuit elements using a 741 op-amp with a ±12 V supply. Assume $V_B = 0.1$ V and $\Delta V = 1$ V. **(08 Marks)**

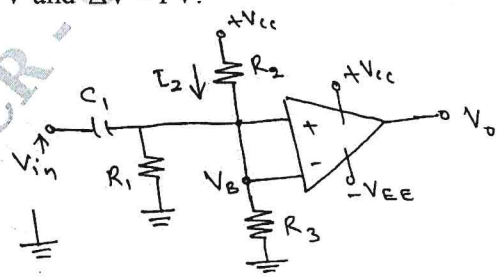

Fig. Q5 (b)

OR

6 a. Using a bipolar op-amp with a ± 18 V supply, design an inverting Schmitt Triggering circuit is to have UTP = 1.5 V and LTP = -3 V. Draw input and output waveforms. Assume $R_1 = 27\,K\Omega$. **(08 Marks)**

b. With mathematical equations and circuits of log amplifier, explain the problem of variation of emitter saturation current and dependence of an device parameter and temperature. **(08 Marks)**

Module-4

7 a. Explain the circuit operation of second order Lowpass Filter. Write the design equations for calculating circuit elements. **(08 Marks)**

b. List and explain the characteristics of a three terminal IC regulator. **(08 Marks)**

OR

8 a. Design a second order high pass active filter to have a cutoff frequency of 12 kHz. Use a 715 op-amp with $F_B(max) = 1.5\ \mu A$ and also estimate the highest signal frequency that will be passed. Assume $f_u = 11$ MHz. **(04 Marks)**

b. Design an adjustable regulator from 7805 regulator to get an output voltage of 7.5 V. Assume $I_Q = 4.2$ mA and $I_{R_1} = 25$ mA. **(04 Marks)**

c. Draw the Functional diagram of 723 regulator and explain it. **(08 Marks)**

Module-5

9 a. Draw the circuit diagram of a digital type XOR phase detector and waveforms. Explain its operation. **(08 Marks)**

b. For a Astable multivibrator using 555 Timer has $R_A = 6.8\ K\Omega$, $R_B = 3.3\ K\Omega$ and $C = 0.1\ \mu F$. Calculate (i) t_{High} (ii) t_{Low} (iii) Free running frequency (iv) Duty cycle. **(08 Marks)**

OR

10 a. Explain the operation of a ADC using Successive Approximation. **(08 Marks)**

b. Draw the block diagram of a PLL and explain it. **(08 Marks)**

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