CBCS Scheme

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15EC46

Fourth Semester B.E. Degree Examination, June/July 2017
Linear Integrated Circuits

Time: 3 hrs. Max. Marks: 80

Note: *Answer FIVE full questions, choosing one full question from each module.*

Module-1

1 a. With a neat circuit diagram, explain basic operational amplifier circuit. **(06 Marks)**

b. Define CMRR of an operational amplifier. A741 op-amp is used in a non-inverting amplifier with a voltage gain of 50. Calculate the typical output voltage that would result from a common mode input with a peak level of 100 mV. **(05 Marks)**

c. Design an averaging circuit to give the average of two inputs which each range from 0.1 V to 1 V. Use 741 op-amp. **(05 Marks)**

OR

2 a. Sketch the circuit of an op-amp difference amplifier circuit. Discuss the working and common mode nulling capability with necessary circuit modification and equations. **(08 Marks)**

b. With a neat circuit diagram, explain direct coupled voltage follower. Also compare voltage follower with emitter follower. **(08 Marks)**

Module-2

3 a. Draw the circuit of a capacitor coupled non-inverting amplifier and explain with necessary design equations. Design a high input impedance capacitor coupled non-inverting amplifier with a gain of 100 and lower cut off frequency of 100 Hz. Assume the load resistance is 2.2 KΩ and input parasitic capacitance as 15 pF. **(10 Marks)**

b. Design a capacitor coupled inverting amplifier for a pass band gain of 100, lower cut off frequency of 120 Hz and upper cutoff frequency to be 5 kHz. Use LF353 BIFET opamp and assume load resistance as 2 KΩ. **(06 Marks)**

OR

4 a. Draw the circuit of an instrumentation amplifier and explain. Also show the method of nulling common mode outputs and how dc output voltage can be level shifted. **(09 Marks)**

b. Design a non-saturating precision half wave rectifier to produce a 2 V peak output from a 1 MHz sine wave input with a 0.5 V peak value. Use a bipolar op-amp with a supply voltage of ±15V. **(07 Marks)**

Module-3

5 a. Sketch the circuit of a symmetrical precision clipper and explain with necessary equations and waveforms. Using bipolar opamp design the circuit to clip a 100 kHz sine wave at ±3V level. **(09 Marks)**

b. Explain the working of Weinbridge oscillator with the help of circuit diagram, waveforms and equations. **(07 Marks)**

OR

6 a. Sketch the circuit of fundamental log amplifier and explain its operation. Also derive an expression for its output voltage. Also mention its drawback. **(08 Marks)**

b. With a neat circuit diagram, explain the operation of inverting Schmitt trigger. Using 741 op-amp with a supply of ± 12 V, design an inverting Schmitt trigger circuit to have trigger points of UTP = 0 V and LTP = -1 V. **(08 Marks)**

Module-4

7 a. Explain the operation of first order low pass filter with neat circuit diagram, frequency response and design steps. Using a 741 opamp, design a first order active low pass filter to have a cutoff frequency of 2 kHz. **(08 Marks)**

b. Draw the circuit of a single stage band pass filter and explain the operation with necessary design equations. **(08 Marks)**

OR

8 a. Draw the standard representation of 78XX series 3-terminal IC regulator and enumerate the characteristics of this type of regulators. Also define the following performance parameters of a voltage regulator. (i) Line regulation (ii) Load regulation (iii) Ripple rejection **(08 Marks)**

b. With a neat diagram, explain the operation of low voltage regulator using IC723. Design a voltage regulator circuit using LM723 to obtain $V_0 = 5$ V and $I_0 = 2$ A. **(08 Marks)**

Module-5

9 a. With a neat block schematic, explain the operating principle of PLL. Also define (i) Lock-in range (ii) Capture range and (iii) Pull-in time. **(08 Marks)**

b. Explain the working of Flash ADC with necessary diagram. An 8 bit ADC outputs all 1's when $V_i = 2.55$ V. Find its (i) resolution in mV/LSB and (ii) digital output when $V_i = 1.28$ V **(08 Marks)**

OR

10 a. Draw the internal schematic of IC555, configuring it for astable operation and explain with necessary equations and waveforms. **(08 Marks)**

b. With necessary circuit diagram and equations, explain R-2R DAC. What output voltage would be produced by a DAC whose output range is 0 to 10 V and whose input binary number is, (i) 1010 (for 4 bit DAC) (ii) 10111100 (for an 8 bit DAC). **(08 Marks)**

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