Code No: R31043 **R10** **Set No: 1**

III B.Tech. I Semester Regular Examinations, November/December - 2012

LINEAR IC APPLICATIONS

(Common to Electronics and Communications Engineering & Electronics and Instrumentation Engineering & Bio-Medical Engineering & Electronics and Computer Engineering)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions

All Questions carry equal marks

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1. (a) Explain DC coupling of cascaded differential amplifiers using relevant diagrams and necessary expressions.
   (b) Explain why R_E is replaced by a constant current source in a differential amplifier circuit.

2. (a) An op-amp has a slew rate of 2V/μs. Find the rise time for an output voltage of 15V amplitude resulting from a rectangular pulse input if the op-amp is slew rate limited.
   (b) Define input offset voltage, total output offset voltage and also present the methods of compensation.

3. (a) Design a circuit using op-amp to generate a output $V_o = 0.1V_1 - V_2 + 10V_3$ where V_1, V_2, V_3 are input voltages.
   (b) Explain the working of a Transconductance amplifier with floating and grounded loads. Is there any limitation on the size of the load when grounded?

4. (a) Construct a full wave rectifier using op-amps and explain the operation using the equivalent circuits and wave forms for $V_i > 0$ and $V_i < 0$, where V_i is input voltage.
   (b) What is the purpose of clamp diodes in a comparator? Draw a comparator where clamp diodes are used and explain the operation of a basic comparator.

5. (a) Draw the circuit diagram of a second order low-pass Butterworth filter and write the design steps of such filter.
   (b) Design a first order low-pass Butterworth filter with a cutoff frequency of 3 kHz and passband gain of 3.

6. (a) Draw the block diagram of a 565 PLL and explain its salient features. Derive the expression for capture range.
   (b) Explain the application of PLL as a frequency translator.

7. (a) A dual slope ADC uses a 16-bit counter and a 4 MHz clock rate. The maximum input voltage is +10V. The maximum integrator output voltage should be -8 V when the counter has cycled through 2^n counts. The capacitor used in the integrator is 0.1μF. Find the value of the resistor R of the integrator. If the analog signal voltage is +4.129 V, find the equivalent digital number.
   (b)Explain the working of successive approximation type converter and compare the conversion times of tracking and successive approximation type ADCs.

8. Write short notes on
   (a) Sample and hold amplifiers
   (b) Four quadrant multiplier

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Code No: R31043 **R10** **Set No: 2**

III B.Tech. I Semester Regular Examinations, November/December - 2012

LINEAR IC APPLICATIONS

(Common to Electronics and Communications Engineering & Electronics and Instrumentation Engineering & Bio-Medical Engineering & Electronics and Computer Engineering)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions

All Questions carry equal marks

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1. (a) Explain the methods to improve CMRR using relevant circuit diagrams.
   (b) Describe the advantages of differential amplifiers and justify their applicability in op-amp with reference to stability and noise immunity.

2. (a) Derive slew rate equation and discuss the effect of slew rate in applications of op-amp.
   (b) Explain the term thermal drift. Find the output voltage of a non-inverting amplifier if the temperature rises to 50^{o}C for an offset voltage drift of 0.15mV/^{o}C if it was nulled at 25^{o}C.

3. (a) Design a circuit using an op-amp to generate a output $V_o = -(0.2V_1+10V_2+V_3)$, where V_1, V_2, V_3 are input voltages.
   (b) Explain the operation of high input impedance non-inverting AC amplifier.
   (c) Explain the operation of a practical differentiator.

4. (a) Construct a half wave rectifier using op-amps and explain the operation using relevant wave forms.
   (b) Draw the circuit of an anti-log amplifier and support with appropriate derivation.

5. (a) Describe the characteristics of a first order low-pass Butterworth filter and write the design steps of such filter.
   (b) Design a second order low-pass Butterworth filter at a high cutoff frequency of 2 kHz and write the expression for magnitude of frequency response of such filter.

6. (a) Draw the block diagram of a 565 PLL and explain its salient features. Derive the expression for lock range.
   (b) Design a 1 kHz square wave generator using 555 timer for duty cycle i)0.25 ii)0.5.

7. (a) Draw the circuit diagram of a 6 bit inverted R-2R ladder DAC. For V(1) = 5V, what is the maximum output voltage? What is the minimum voltage that can be resolved?
   (b) Explain the operation of dual slope ADC.

8. Write short notes on
   (a)Multiplexers.
   (b) Four quadrant multiplier.

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Code No: R31043 **R10** **Set No: 3**

III B.Tech. I Semester Regular Examinations, November/December - 2012

LINEAR IC APPLICATIONS

(Common to Electronics and Communications Engineering & Electronics and Instrumentation Engineering & Bio-Medical Engineering & Electronics and Computer Engineering)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions

All Questions carry equal marks

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1. (a) Draw the differential Amplifier circuit using BJT.
   (b) A differential amplifier has (i) CMRR = 1000 and (ii) CMRR = 10000. The first set of inputs is ν_1 = 100 μV and ν_2 = -100 μV. The second set of inputs is ν_1 = 1100 μV and ν_2 = 900 μV. Calculate the percentage difference in output voltages obtained for the two sets of input voltage and also comment on this.

2. (a)For an op-amp PSRR =60 db(min), CMRR= 10^4 and the differential mode gain is 10^5, the voltage changes by 20 V in 4 μ sec. calculate (i) numerical value of the PSRR (ii) common mode gain. (iii) Slew rate.
   (b) Explain why the frequency compensation is needed in op-amp's and what is role of a phase and gain margin.

3. (a) Explain how op-amp is used as differentiator with necessary equations. Draw the input and output waveforms by considering the sine wave as a input.
   (b) For a non inverting single supply AC amplifier R_{in}=50 Ω, C_i=0.1μF, C_1=0.1μF, R_1=R_2=R_3=100K Ω, R_f= 1M Ω and V_{CC}= +12 V. Determine the bandwidth of the amplifier and maximum voltage swing.

4. (a)Draw the Schmitt trigger circuit using OPAMP and explain its operation.
   (b) Explain about the zero crossing detector? How it is used as sine wave to square converter.

5. (a) Design a wide band reject filter having f_H=200 Hz, f_L=1 KHz with pass band gain of 2.
   (b) Why the narrow band filter is called as notch filter? Explain.

6. (a) Explain the operation of the PLL with the help of the block diagram.
   (b) Explain how the PLL is used as frequency synthesizer.

7. (a) Explain the working of the weighted resistor digital to analog converter and state the features.
   (b)LSB of 9-bit DAC is represented by 19.6 Volts. If an input of 9 zero bits is represented by 0 volts.
   (i) Find the output of the DAC for an input of 10110 1101 and 01101 1011.
   (ii)What is the full scale reading (FSR) of this DAC.

8. write a short note on
   (a) Sample and hold circuit.
   (b) Analog switches.

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Code No: R31043 **R10** **Set No: 4**

III B.Tech. I Semester Regular Examinations, November/December - 2012

LINEAR IC APPLICATIONS

(Common to Electronics and Communications Engineering & Electronics and Instrumentation Engineering & Bio-Medical Engineering & Electronics and Computer Engineering)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions

All Questions carry equal marks

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1. (a)For a differential amplifier R_C=1 KΩ, R_S=1 K Ω, h_{ie}=1 K Ω, h_{fe}=50, the emitter resistance of 2.5 M Ω while the differential input of 1 mV. Calculate the output voltage and CMRR in db. If the common mode input is 20 mV. Assume single ended output.
   (b) Explain the use of the active load to improve the CMRR.

2. (a) Explain the op-amp operation with the help of the block diagram.
   (b) Write the characteristics of the ideal op-amp? Write the characteristics and draw the pin diagram for 741 op-amp.

3. (a) Explain how the op-amp is used as integrator with necessary equations and draw the input and output waveforms by considering the square wave as input.
   (b) Design an inverting amplifier with an input resistance of 5 K Ω and the gain of -4.

4. (a) Design a op-amp free running multivibrator with ON period of 2 m sec. and OFF period of 3 msec.
   (b) Discuss how op amp is used as comparator. What are the limitations of the op-amp as comparators?

5. (a) What is an all pass filter? Show that the magnitude response of the all pass filter is 1.
   (b) Design a first order high pass filter at cutoff frequency of 500Hz. And pass band gain of 1.

6. (a) Explain the role of a low pass filter in PLL.
   (b) Explain about the free running range, capture range and lock range in PLL with necessary equations.

7. (a) Explain the R-2R Digital to analog converter with necessary sketches.
   (b) Find the step size and analog output for 4-bit R-2R ladder DAC when the input is 1000 and 1111. Assume V_{ref}=+5V.
   (c) If the maximum output voltage of a 7 bit D/A converter is 25.4 V. What is the smallest change in the output as the binary count increases.

8. write a short notes on
   (a) Analog switches.
   (b) Applications of the Sample and hold circuits.

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