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

III B.Tech. I Semester Regular and Supplementary Examinations, December - 2013

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 circuit diagram of dual input unbalanced output differential amplifier and derive the expression for dc analysis.
   (b) Design a constant current bas circuit using zener diode for the following specifications: I_{E3}=5mA, zener diode with V_z=4.7V, I_{zt}=5.3mA, transistor with β_{ac}= β_{dc}=100 and V_{BE} = 0.175V, V_{CC}=V_{EE}= 9 Volts.

2. (a) Draw the pin diagram and schematic symbol of a typical OP-AMP IC741 and explain the function of each pin.
   (b)For an OP-AMP, PSRR is 70dB, CMRR is 10^5, and differential mode gain is 10^5. The output voltage changes by 20V in 4 µsec. Calculate: (i) numerical value of PSRR (ii) Common mode gain and (iii) Slew rate.

3. (a) Draw and explain the ideal differentiator circuit using an Op-Amp. Mention its drawbacks and how these can be eliminated by using a practical differentiator.
   (b)For the non-inverting a.c amplifier R_{in}=50Ω, C_i=0.1µf, R_1=100Ω, R_F=1kΩ and R_O=10kΩ. Determine the gain & band width of the amplifier.

4. (a) Explain the principle of operation of a log amplifier with neat circuit diagram.
   (b)Design a Schmitt trigger with an Op-Amp µA741 with the following specifications and also determine the threshold voltages V_{UT} and V_{LT}.
   R_1 = 100kΩ, R_2 = 56kΩ, V_{IN}(pp) = 1V and V_{CC} = V_{EE} = 15V

5. (a) Draw the circuit diagram of fourth order butter worth low pass filter using an Op-Amp. And also draw the frequency response of it.
   (b)For the all pass filter, determine the phase shift between the input and output at f=2kHz. To obtain a positive phase shift, what modifications are necessary in the circuit?

6. (a)Design an astable multivibrator using 555 Timer to operate at 10 KHz with 40% duty cycle.
   (b)With a suitable circuit diagram using NE 565 PLL IC, explain the implementation of a frequency translation.

7. (a) List and compare different types of analog to digital converters.
   (b) Explain the operation of successive approximation type ADC with neat circuit diagram.

8. (a) Briefly explain the applications of analog multiplexers.
   (b)Draw the circuit diagram of sample and hold circuit and explain its working.

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

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LINEAR IC APPLICATIONS

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

Answer any FIVE Questions

All Questions carry equal marks

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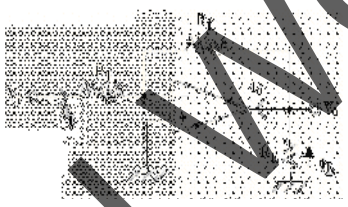
1. (a) What is a differential amplifier? Mention the classification of differential amplifier with neat diagrams.
   (b) Draw the ac and dc equivalent circuits of single input balanced output differential amplifier and also derive an expression for voltage gain of this differential amplifier.

2. (a) What are the differences between the inverting and non inverting terminals? What do you mean by the term "virtual ground"?
   (b) For the circuit shown below; calculate I_1, I_L and V_0 with R_1=10kΩ, R_f=100kΩ, V_i=1V, R_L= 25KΩ.



3. (a) With suitable circuit diagram explain about voltage to current converter with grounded load and also derive the expression for the output current.
   (b) Design a differentiator circuit to differentiate an input signal that varies in frequency from 10Hz to about 1kHz. Draw its output waveform, if $Sin[2\pi(1000)t]$ signal is applied.

4. (a) With neat circuit diagram, explain the operation of monostable multivibrator using an Op-Amp. And also derive an expression for the time period.
   (b) Design a triangular wave generator with the following specifications: f_o=2kHz, V_0(pp)=7V and supply voltage is ±15V

5. (a) With neat circuit diagram explain the operation of 2nd order butter worth HPF and derive an expression for voltage gain.
   (b) A certain narrow band pass filter has been designed to meet the following specification: f_C =2kHz, Q = 20, and A_F =10. What modifications are necessary in the filter design to change f_C to 1kHz keeping gain and bandwidth constant?

6. (a) In the astable mode of 555 Timer, R_A=2.2kΩ, R_B=3.9kΩ and C=0.1μf. Determine the positive pulse width t_C, negative pulse width and free running frequency f_0. And also find the duty cycle.
   (b)With a neat functional diagram, explain the operation of VCO and also derive an expression for free running frequency, f_0.

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7. (a) Which type of DAC is more preferable? Draw the circuit diagram and obtain expression for output voltage for 4 bits.
   (b) What is an integrating type ADC? Explain the operation of dual slope ADC.

8. (a) Draw the circuit diagram of four quadrant multiplier and explain briefly.
   (b) Draw the circuit diagram of balanced modulator using IC1496 and explain in detail.

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

III B.Tech. I Semester Regular and Supplementary Examinations, December - 2013

LINEAR IC APPLICATIONS

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

Answer any FIVE Questions

All Questions carry equal marks

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1. (a) Design a level translator circuit using current mirror circuit for the following specifications: input to the level translator is 9.32V, I_{E6}=3mA, V_S=±10V.
   (b) Explain briefly about constant current bias circuit using resistive network.

2. (a) Mention the types of open loop configurations of an Op-Amp. Explain each configuration in detail.
   (b) Explain the following characteristics of an Op-Amp: (i) Slew Rate (ii) CMRR (iii) PSRR.

3. (a) What is a summer? Design a summer to add 4 input voltages in inverting configuration.
   (b) What are the special cases of closed loop inverting amplifier and explain each one in detail.

4. (a) Draw the regenerative comparator circuit and derive an expression for threshold voltages V_{LT} and V_{HT}.
   (b) Describe the principle of operation of a precision half wave rectifier with waveforms.

5. (a) With suitable circuit diagram explain the operation of Narrow band pass filter (NBPF) and give the necessary design expression.
   (b) Design a wide band reject filter using the first order HPF and LPF having f_L=2kHz and f_H=400Hz respectively and with a pass band gain of 2.

6. (a) Using a 555 Timer, design a monostable multivibrator having an output pulse width of 100msec.
   (b) Briefly explain the block diagram of PLL and also derive the expression for lock range and capture range.

7. (a) Explain the following terms with respect to ADCs: (i) Conversion Time (ii) Resolution (iii) Linearity
   (b) Give the schematic circuit diagram of the fastest A/D converter and explain its operation.

8. (a) Draw the circuit diagram of balanced modulator using IC1496 and explain in detail.
   (b) Draw the circuit diagram of sample and hold circuit and explain its working.

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

III B.Tech. I Semester Regular and Supplementary Examinations, December - 2013

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. With suitable circuit diagram explain about Dual input balanced output differential amplifier. And derive necessary expressions for dc and ac analysis.

2. (a) What is an Op-Amp? Draw the functional block diagram of an Op-Amp and explain each block in detail.
   (b) Mention the ideal and practical characteristics of an Op-Amp.

3. (a) Explain and derive an expression for the voltage gain of closed loop inverting amplifier with three Op-Amps.
   (b) Design an adder circuit using an Op-Amp to get the output expression as $V_0 = -(0.1V_1 + V_2 + 10V_3)$.

4. (a) What are the drawbacks in a Zero-Crossing Detector (ZCD)? How these drawbacks can be overcome by using a Schmitt trigger. Explain.
   (b) Design a triangular wave generator using a comparator and an integrator, so that f_o=2kHz and $V_{o(p\text{-}p)}$=7V. The supply voltages are ±15V. Assume $\pm V_{sat} = \pm 14V$.

5. (a) What is an all pass filter? Explain the principle of operation of this filter with neat circuit diagram.
   (b) Design a high pass filter at a lower cutoff frequency of 600Hz and a pass band gain of 2.

6. (a) With neat circuit diagrams, explain the astable mode of operation of 555 Timer.
   (b) List the applications of PLL? Explain any two applications of PLL in detail.

7. (a) Compare successive approximation ADC with parallel comparator type ADC.
   (b) Draw the complete block schematic circuit including gating circuit, level amplifiers of R-2R 4 bit D/A converter and explain its operations. Derive expression for its output voltage V_o.

8. (a) Give the working principle of Analog-Multiplexer. Give block diagram of a 16 input analog multiplexer using CMOS gates and explain how it works
   (b) Mention the applications of analog multiplexers and explain any two applications.

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