Code No: R05310401 **Set No. 1**

III B.Tech I Semester Supplimentary Examinations, February 2008
LINEAR IC APPLICATIONS
(Electronics & Communication Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Derive the output voltage of an op - amp based differential amplifier.
   (b) List out electrical characteristics of an op - amp. [10+6]

2. (a) List out the AC characteristics of an op-amp and discuss about them?
   (b) For an op-amp, PSRR=70dB(min), CMRR=10^5, differential mode gain, A_d=10^5. The output voltage changes by 20v in 4 microseconds. Calculate
      i. numerical value of PSRR
      ii. Common mode gain
      iii. Slew rate of the op - amp. [10+6]

3. (a) Explain how an op - amp can be used as summing amplifier? Draw the diagram of a four input summer and obtain the expression for the output.
   (b) The circuit of a inverting summing amplifier is designed with R_1 = R' =1Kohm, and $R_2 = 2R_1$, $R_3 = 2R_2$,?Rn = $2R_{n-1}$, the input voltages v_1,v_2,?v_n can be 0 to 10V.
      i. For n = 4, what is the smallest output voltage if at least one input is nonzero?
      ii. For n = 4, what is the maximum output voltage? [8+8]

4. (a) Design a logarithmic amplifier for positive input voltages in the range 5mV to 50V.
   (b) With suitable circuit diagram explain the operation of a triangular wave generator using a comparator and a integrator. [8+8]

5. (a) Define Bessel, Butterworth and Chebysher filters, and compare their frequency response.
   (b) Sketch the circuit diagram of band elimination filter and design a wide band-reject having f_H=200Hz and f_L=1KHz. Assume necessary data. [8+8]

6. (a) Give the functional block diagram of NE 565 PLL (DIP) and for the given components values. C_1 = 390PF, C_2 = 680PF and R_1 = 10k, V_{cc} = ±6V Find
      i. The free running frequency
      ii. The lock range and capture range

   Where C_1 is capacitor connected between pin number 9 and -V_{cc}, C_2 is the capacitor connected between +V_{cc} and ouput pin 7, and R_1 is connected between pin number 8 and +V_{cc}.

(b) Give the functional block diagram of VCO NE 565 and explain its working and necessary expression for free running or center frequency. [8+8]

7. (a) What are the basic blocks preceding an Analog to Digital converter in a typical application like digital audio recording?

   (b) Draw the circuit of weighted resistor DAC and derive expression for output analog voltage V_o.

   (c) Compare merits and demerits of A/D converters. [6+6+4]

8. (a) What are the different types of multiplexers? Explain logic diagram and truth table of Dual 4 to 1 line multiplexer.

   (b) Explain the operation of balanced modulator using neat sketch. [10+6]

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Code No: R05310401 **Set No. 2**

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LINEAR IC APPLICATIONS
(Electronics & Communication Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Explain cascade connection of differential amplifier for active load.
   (b) Write the properties of different configurations of differential amplifier. [8+8]

2. (a) Compute the maximum possible total output voltages in the amplifier circuits shown in figure 2. The op - amp is the MC1536 with the following specifications:
   V_{io} = 7.5mV maximum; I_{io} = 50nA maximum; I_B = 250 nA maximum at T_A = 25^0C.
   (b) Explain the difference between the slew rate and the transient response.
   (c) Briefly explain the need for compensating networks in op - amps. [4+6+6]

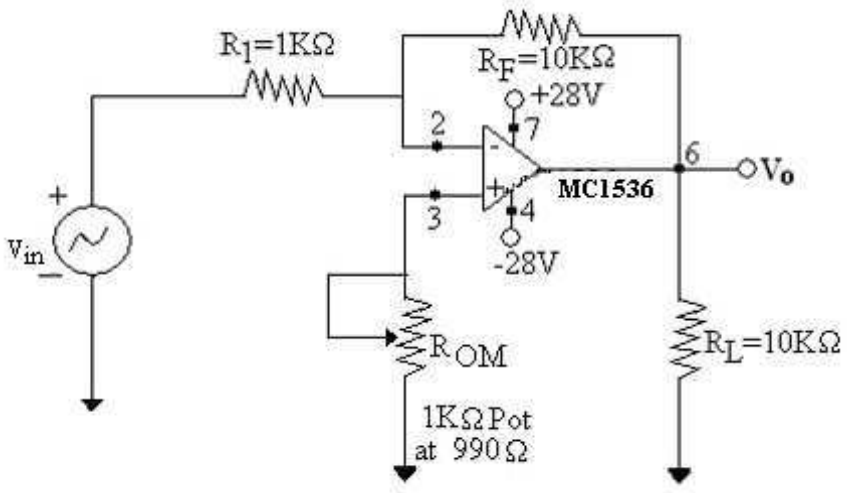

Figure 2

3. (a) Find V_0 for the circuit shown in figure 3
   (b) Find R_1 and R_f in the practical integrator (lossy integrator), so that the peak gain is 20 dB and the gain is 3 dB down from its peak when ω = 10,000 rad/sec. Use a capacitance of 0.01μF. [8+8]

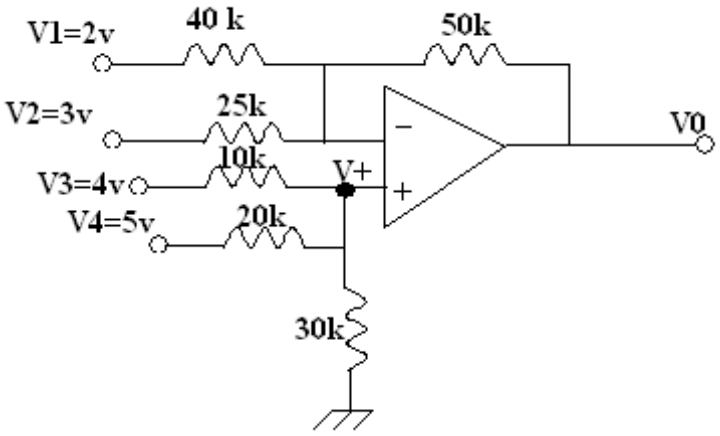

Figure 3

4. Design and explain a saw tooth waveform generator using operational amplifier and plot the waveforms for the given specifications frequency = 5kHz, $V_{sat} = \pm 12$ Volts. [16]

5. (a) Design a fourth order Butterworth low pass filter whose bandwidth is 1kHz. Select all capacitors equal to 1000nF.
   (b) Explain the operation of narrow band pass filter and obtain the frequency response. [8+8]

6. (a) Draw the block schematic of a PLL describing the function of each block briefly.
   (b) What is the purpose of low pass filter in a phase locked loop? Describe different types of low pass filters used in PLL. [8+8]

7. (a) What are the basic blocks preceding an Analog to Digital converter in a typical application like digital audio recording?
   (b) Draw the circuit of weighted resistor DAC and derive expression for output analog voltage V_o.
   (c) Compare merits and demerits of A/D converters. [6+6+4]

8. What are all basic blocks of analog multiplexer? Explain how the data selections process is performed it. [16]

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Code No: R05310401 **Set No. 3**

III B.Tech I Semester Supplimentary Examinations, February 2008
LINEAR IC APPLICATIONS
(Electronics & Communication Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) List out different configurations of differential amplifier. Explain any one of them in detail.
   (b) Determine the emitter current in transistor Q_3 of figure 1. If $V_{BE} = 0.7V$ and $\beta = 100$. [10+6]

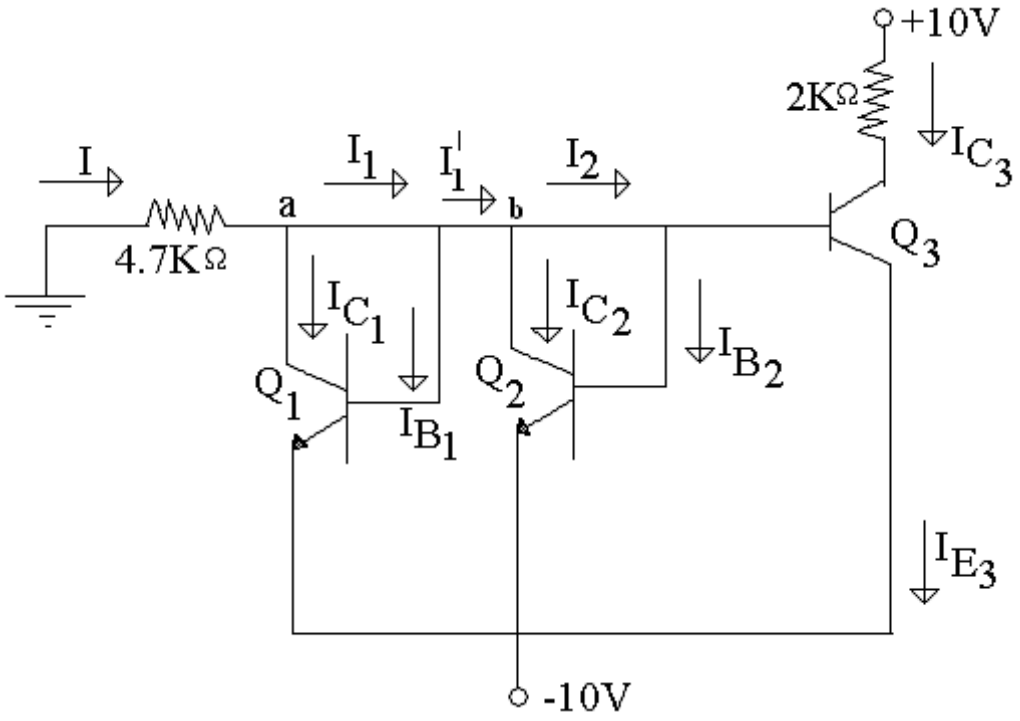

Figure 1

2. (a) Explain the effect of slew rate on both open loop and closed loop op - amp circuits.
   (b) What is the major difference between the power supply requirements of linear and digital Ics.
   (c) Draw and explain an ideal voltage transfer curve for an op - amp. [8+4+4]

3. (a) What is a summer? Design a summer to add 4 input voltages in inverting configuration.
   (b) What are the differences between the inverting and non-inverting terminals? What do you mean by the term "virtual ground".
   (c) Briefly explain about the buffers used in amplifier circuits. [6+6+4]

4. (a) Design a logarithmic amplifier for positive input voltages in the range 5mV to 50V.
   (b) With suitable circuit diagram explain the operation of a triangular wave generator using a comparator and a integrator. [8+8]

5. (a) Derive the expression for the transfer function of 2^{nd} order Low pass filter.
   (b) Give the functional block diagram of VCO NE 566 and explain its working and necessary expression for free running or center frequency. [8+8]

6. Explain an application in which the 555 timer can be used as Astable multivibrator. [16]

7. (a) What are the basic blocks preceding an Analog to Digital converter in a typical application like digital audio recording?
   (b) With the help of a neat circuit diagram and waveforms, explain the operation of a dual slope ADC. What are its special features? [6+10]

8. What are all basic blocks of analog multiplexer? Explain how the data selections process is performed it. [16]

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Code No: R05310401 **Set No. 4**

III B.Tech I Semester Supplimentary Examinations, February 2008
LINEAR IC APPLICATIONS
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Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Why is it necessary to use an external offset voltage compensating network with practical op - amp circuits.
   (b) Compare and contrast an ideal op - amp and practical op - amp.
   (c) Explain the precautions that can be taken to minimize the effect of noise on an op - amp circuit.
   (d) Calculate the effect of variation in power supply voltages on the output-offset voltage for an inverting amplifier circuit. [3+5+5+3]

2. (a) Compare and contrast an ideal operational amplifier and practical operational amplifier.
   (b) Give the design procedure of a compensating network for an op - amp that uses ± 10 V supply voltages. Assume necessary data. [8+8]

3. (a) Design a differentiator to differentiate an input signal that varies in frequency from 10 Hz to about 1KHz. If a sine wave of 1V peak at 1000 Hz is applied to this differentiator draw the output waveforms.
   (b) Why active differentiator circuits are not used in analog computer to solve differential equations. [10+6]

4. (a) Distinguish between astable, bistable and monostable multivibrators.
   (b) Determine V_{TH} and V_{TL} (TL: Lower threshold, TH: upper threshold) and hysteresis of the inverting comparator shown in figure4 [8+8]

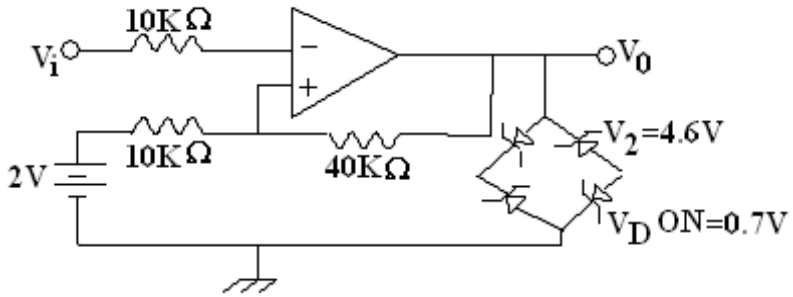

Figure 4

5. (a) Draw a band - pass filter circuit with its frequency response curve. Explain its working.
   (b) Design a first order wide band reject filter with a higher cutoff frequency of 100Hz and a lower cutoff frequency of 1kHz. Calculate the Q of the filter. [8+8]

6. (a) Draw the dc voltage versus phase difference characteristic of balanced modulator phase detector of a PLL indicating all important regions.
   (b) Draw the dc output voltage of VCO versus frequency characteristic of a PLL indicating the capture and lock range clearly.
   (c) State the relationship between lock range and capture range through a mathematical expression. [6+6+4]

7. (a) Sketch and explain the transfer characteristic of a DAC with necessary equations.
   (b) LSB of a 9 - bit DAC is represented by 19.6mv. If an input of 9 zero bits is represented by 0 volts.
      i. Find the output of the DAC for an input 10110 1101 and 01101 1011.
      ii. What is the Full scale reading (FSR) of this DAC? [8+8]

8. (a) What are the different types of multiplexers? Explain logic diagram and truth table of Dual 4 to 1 line multiplexer.
   (b) Explain the operation of balanced modulator using neat sketch. [10+6]

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