Code No: RR310404 **Set No. 1**

III B.Tech I Semester Regular Examinations, November 2006
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) An op-amp has a slew rate of 2V/μs. What is the maximum frequency of an output sinusoid of peak value 5V at which the distortion sets in due to the slew rate limitation.
   (b) If the sinusoid of 10V peak is specified, what is the full power band width? [8+8]

2. (a) Design a logarithmic amplifier for positive input voltages in the range 5mV to 50V.
   (b) Explain the operation of antilog amplifier circuit. [8+8]

3. (a) Draw a neat circuit diagram of an integrator circuit. Explain its functioning with the input-output wave forms.
   (b) Derive the output voltage V_0 of an integrator circuit. [8+8]

4. (a) Design a wide band-pass filter with f_L = 200Hz, f_H = 1KHz and the pass band gain = 4; also calculate the value of Q of the filter.
   (b) Draw the frequency response plot of the above filter. [10+6]

5. (a) With suitable circuit diagram explain the operation of a triangular wave generator using a comparator and an integrator.
   (b) In the above circuit if the integrator components are R_1=120KΩ and C_1=0.01 μFand the feedback resistor in the comparator stage is 6.8KΩ, the input resistor at non inverting terminal is 1.2KΩ, determine
      i. Peak-to-peak triangular output amplitude
      ii. The frequency of triangular wave. [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 out put 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) Explain the operation of an op-amp based weighted resistor Digital to Analog Converter through a neat circuit diagram.

(b) Design a 4-bit weighted resistor DAC whose full-scale output voltage is -10Volts. Assume R_f= 10 kΩ and logic '1' level as + 5volts. And logic '0' level as 0 volts. What is the output voltage when the input is 1011. [8+8]

8. Write short notes on:

(a) Tracking type Analog to Digital converters.

(b) Comparison of conversion times and hardware complexities of various Analog to Digital converters. [8+8]

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Code No: RR310404 **Set No. 2**

III B.Tech I Semester Regular Examinations, November 2006
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 the AC characteristics of an op-amp and discuss about them.
   (b) A 741 op-amp is used as an inverting amplifier with a gain of 50. the voltage gain V_s. frequency curve of 741 is flat up to 20 KHz. What is the maximum peak to peak input signal that can be applied with out distorting the output. [10+6]

2. (a) Design a logarithmic amplifier for positive input voltages in the range 5mV to 50V.
   (b) Explain the operation of antilog amplifier circuit. [8+8]

3. (a) Draw the basic circuit diagram of an op-amp differentiator and explain its operation and stability.
   (b) Design a practical integrator to produce a peak voltage of 0.1V; when $V_i = 10 \sin(2\Pi \times 10^4 t)$. Find the dc component at the output when the input is +10mV dc. [8+8]

4. (a) Explain the advantages of active filter. Explain different configurations of active filter. Discuss their merits and demerits.
   (b) Design a Band Pass filter with Butterwarth response for the following specifications $f_0 = 10$ KHz, Q = 10 and Pass band gain $\geq$10. [10+6]

5. Write short notes on:
   (a) Frequency of oscillation of a square wave generator.
   (b) Triangular wave generator using a square wave generator. [8+8]

6. Describe any two applications of 555 timer in
   (a) Astable multivibrator configuration.
   (b) Monostable multivibrator configuration. [8+8]

7. (a) Explain the operation of a multiplying DAC and mention its applications.
   (b) A 12-bit D to A converter has a full-scale range of 15 volts. Its maximum differential linearity error is $\pm$ 1/2 LSB.
      i. What is the percentage resolution?
      ii. What are the minimum and maximum possible values of the increment in its output voltage? [8+8]

8. (a) Explain the operation of an 8-bit tracking type Analog to Digital converter.
   (b) Compare the conversion times and efficiencies of 8-bit tracking type and successive approximation type Analog to Digital converters. [8+8]

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Code No: RR310404 **Set No. 3**

III B.Tech I Semester Regular Examinations, November 2006
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) Broadly classify the integrated circuits for a wide range of applications.
   (b) What is a practical op-amp? Draw its equivalent circuit.
   (c) In an op-amp, $V_2 = 0$ (inverting terminal input). What is the voltage at V_1(non-inverting terminal input) for an output of 5V if $A_{OL} = 50000$. [6+6+4]

2. (a) Draw the circuit of a typical instrumentation amplifier. Why do we use two stage op-amp circuit as an instrumentation amplifier. Explain
   (b) List out the advantages of instrumentation amplifier. [10+6]

3. (a) Design a non-inverting comparator with output levels stabilizes at ±5V and V_{TL}= 0 and V_{TH}= 2.5V (TL: Lower threshold, TH: upper threshold) as shown in the figure3b
   (b) For the given inverting Schmitt trigger, calculate its higher and lower trigger levels. [8+8]

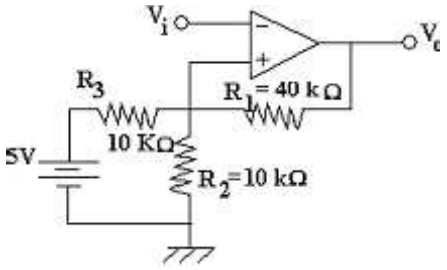

Figure 3b

4. (a) Using the frequency scaling technique, convert the 1KHz cutoff frequency of the low pass filter with a pass band gain of 2 to a cutoff frequency of 1.6KHz.
   (b) Plot the frequency response of the above converted filter. [10+6]

5. (a) With suitable circuit diagram explain the operation of a triangular wave generator using a comparator and an integrator.
   (b) In the above circuit if the integrator components are R_1=120KΩ and C_1=0.01 μFand the feedback resistor in the comparator stage is 6.8KΩ, the input resistor at non inverting terminal is 1.2KΩ, determine
      i. Peak-to-peak triangular output amplitude
      ii. The frequency of triangular wave. [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 out put 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) Describe how frequency division and multiplication can be achieved using a Phase Locked Loop.
   (b) What are the important parameters of PLL which make it suitable for frequency multiplication and division applications? [8+8]

8. (a) Explain the difference between Analog to Digital and Digital to Analog converters through underlying equations.
   (b) Illustrate one application each of Analog to Digital and Digital to Analog converters. [6+10]

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Code No: RR310404 **Set No. 4**

III B.Tech I Semester Regular Examinations, November 2006
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) Broadly classify the integrated circuits for a wide range of applications.
   (b) What is a practical op-amp? Draw its equivalent circuit.
   (c) In an op-amp, $V_2 = 0$ (inverting terminal input). What is the voltage at V_1(non-inverting terminal input) for an output of 5V if $A_{OL} = 50000$. [6+6+4]

2. (a) With the help of a neat circuit diagram explain the working of a logarithmic amplifier.
   (b) Derive the output voltage of an antilog amplifier. [8+8]

3. (a) Draw the basic circuit diagram of an op-amp differentiator and explain its operation and stability.
   (b) Design a practical integrator to produce a peak voltage of 0.1V; when $V_i = 10 \sin(2\Pi \times 10^4 t)$. Find the dc component at the output when the input is +10mV dc. [8+8]

4. (a) 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.
   (b) Draw a band- pass filter circuit with its frequency response curve. Explain its working. [8+8]

5. (a) For a square wave generator with the component values listed below, design an integrator circuit to convert the square wave to a triangular wave. Negative feedback resistor = 10KΩ, capacitor = 0.05μF , positive feedback resistor =11.6KΩ, input resistor at + terminal = 10KΩ Assume IC μA 741 with $\pm$15 volt power supplies.
   (b) What is the requirement for the positive feedback resistance to be a potentiometer?
   (c) What are the difficulties in obtaining high frequencies of oscillation with such square wave generators? [6+6+4]

6. (a) Define the terms 'Lock rage', 'Capture range' and 'Pull in time' of a phase Locked Loop.
   (b) Draw the block diagram of voltage controlled oscillator (VCO) IC NE 566 and explain its operation. [6+10]

7. (a) Explain the operation of a multiplying DAC and mention its applications.

(b) A 12-bit D to A converter has a full-scale range of 15 volts. Its maximum differential linearity error is ± 1/2 LSB.

i. What is the percentage resolution?

ii. What are the minimum and maximum possible values of the increment in its output voltage? [8+8]

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

(b) Explain the functioning of a sample & hold circuit.

(c) Suggest improvement in basic sample & hold circuit. [6+6+4]

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