

**II B.Tech II Semester Supplementary Examinations,
November/December 2005**

LINEAR AND DIGITAL IC APPLICATIONS

**(Common to Electrical & Electronic Engineering, Electronics & Computer
Engineering and Instrumentation & Control Engineering)**

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

**Answer any FIVE Questions
All Questions carry equal marks**

1. (a) Define the terms : SVRR, CMRR, input bias current, input offset voltage, Gain Bandwidth product
(b) What are the differences between the inverting and non inverting terminals? What do you mean by the term “virtual ground”? [10+6]
2. (a) List and explain the two special cases of inverting amplifiers. [6]
(b) What is a voltage follower? What are its features and applications? [4+6]
3. (a) Discuss the functioning of a practical integrator and derive the necessary expressions. [4+4]
(b) Design a practical integrator circuit to properly process input sinusoidal waveforms upto 1 KHz. The input amplitude is 10mV. [8]
4. Explain the functions of each of pins in 555 timer. List the important features of 555 timer. [8+8]
5. (a) Draw the schematic circuit diagram of the following and explain their working.
 - i. Analog phase detector
 - ii. VCO [4+4]Derive necessary expressions.
(b) What is their role is in PLL? Explain. [8]
6. (a) What are the advantages of active filters over passive ones?
(b) Design a second order low pass Butterworth filter for a cut off frequency of $2kHz$. Assume necessary data.
(c) What is an all pass filter? Draw the circuit of the filters. [5+6+5]
7. For the circuit shown below (figure 1)
 - (a) Explain the operations and the circuit with the help of Truth-Table.
 - (b) If h_{FE} of Q_1 is 30, find h_{FEmin} of Q_2 .
 - (c) If h_{FE} of Q_2 is 30, what is Fan-Out?
 - (d) Find Noise Margins. [4x4]

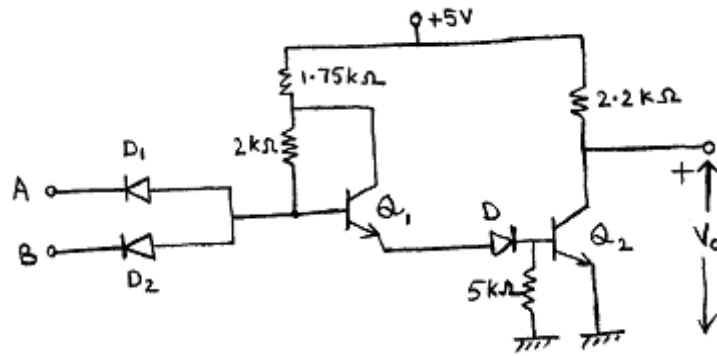


Figure 1:

8. (a) List out and compare different types of A/D converters.
- (b) Give the schematic circuit diagram of the fastest A/D converter and explain its operation. [8+8]

II B.Tech II Semester Supplementary Examinations,
November/December 2005

LINEAR AND DIGITAL IC APPLICATIONS

(Common to Electrical & Electronic Engineering, Electronics & Computer
Engineering and Instrumentation & Control Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Give the design procedure of a compensating network for an OP-AMP which uses $\pm 10\text{V}$ supply voltages. Assume necessary data.
- (b) In the circuit of figure1 below, $R_1=100\Omega$, $R_F=4.7\text{K}\Omega$ CMRR=90 db. If the amplitude of the induced 60-Hz noise at the output is 5mv (rms), calculate the amplitude of the common-mode input voltage V_{cm} . [8+8]

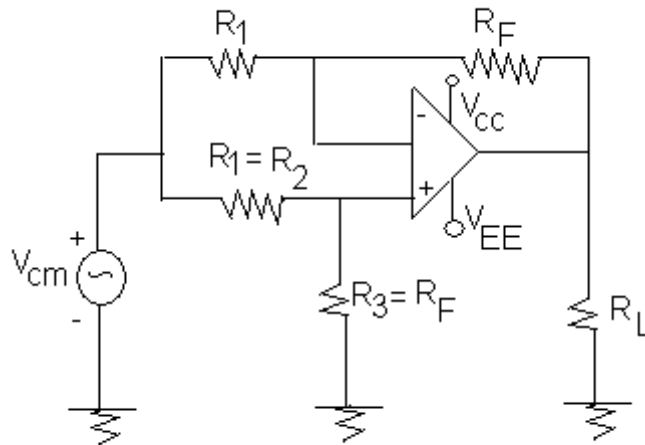


Figure 1:

2. (a) Classify the types of OP-AMP based multipliers. How a multiplier can be used to
 - i. double the incoming frequency
 - ii. detect the phase angle of a signal

[2x5]
- (b) Design a subtractor in non inverting configuration [6]
3. Design a practical integrator with the following specifications:
 - (a) to integrate signals down to 200Hz, and to produce a peak voltage of 0.1V,
 - (b) when the input $V_i = 10 \sin (2\pi \times 10^4 t)$. [8+8]

Find the d.c. Component at the output when input is 10mV d.c.

4. (a) Give methods for obtaining symmetrical square wave using 555 timer.
(b) Discuss any two applications of 555 timer in Monostable mode. [8+8]
5. Define Lock range & Capture range. Why Lock range is usually greater than the capture range? [8+4+4]
6. (a) Derive the transfer function for a general second order sallen-key filter with suitable circuit diagram.
(b) Design a Butterworth filter for a given normalized polynomial of $S^2+1.414S+1$. Assume necessary data. [8+8]
7. (a) Draw the schematic circuits of CMOS NAND and CMOS NOR gates and explain their functions with the help of Truth-Table.
(b) What are the advantages and disadvantages of CMOS over TTL gate?
(c) Which is the fastest saturated logic gate? And Why ? [6+5+5]
8. (a) List out different types of A/D converters.
(b) Draw the schematic circuit diagram of dual-slope A/D converter and explain its operation. Derive expression for output voltage.
(c) Compare dual-slope A/D converter with successive approximation A/D converter. [6+5+5]

**II B.Tech II Semester Supplementary Examinations,
November/December 2005**

LINEAR AND DIGITAL IC APPLICATIONS

**(Common to Electrical & Electronic Engineering, Electronics & Computer
Engineering and Instrumentation & Control Engineering)**

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

**Answer any FIVE Questions
All Questions carry equal marks**

1. (a) Define the terms : SVRR, CMRR, input bias current, input offset voltage, Gain Bandwidth product
(b) What are the differences between the inverting and non inverting terminals? What do you mean by the term “virtual ground”? [10+6]
2. (a) Draw the circuit and explain the working of
 - i. voltage to current converter,
 - ii. current to voltage converter. [2x4](b) Draw a circuit using Op-Amp, which can work as adder (inverting and non-inverting) and explain how it works. [2x4]
3. (a) Briefly describe three uses of an analog multiplier. [8]
(b) What do you mean by sampling? Explain the basic circuit for sample and hold circuit. [2+6]
4. (a) Explain the functions of each of pins in 555 timer.
(b) List the important features of 555 timer. [8+8]
5. Explain the functional block diagram of PLL emphasizing the importance of Capture range and Lock range. [6+5+5]
6. (a) Explain the design procedure (with suitable circuit diagram of a fourth order Butterworth low-pass filter).
(b) A certain narrow band-pass filter has been designed to meet the following specifications: $f_C=2kHz$. $Q=20$, and $A_p=10$. What modifications are necessary in the filter circuit to change the center frequency ' f_c ' to $1kHz$, keeping the gain and band-width constant? [8+8]
7. (a) What is meant by Tri-state logic ? Draw the circuit of Tri-state TTL logic and explain its functions.
(b) Draw the circuit of ECL logic OR/NOR gate and explain its functions. [8+8]
8. (a) Define the following terms with reference to D/A converters.
 - i. Resolution
 - ii. Linearity

- (b) Draw a schematic diagram of a D/A converter. Use resistance values whose ratios are multiples of 2. Explain the operation of the converter.
- (c) Draw the block diagram of a converting A/D converter and explain its operation. Sketch the output waveform. [4+6+6]

**II B.Tech II Semester Supplementary Examinations,
November/December 2005**

LINEAR AND DIGITAL IC APPLICATIONS

(Common to Electrical & Electronic Engineering, Electronics & Computer
Engineering and Instrumentation & Control Engineering)

Time: 3 hours

Max Marks: 80

**Answer any FIVE Questions
All Questions carry equal marks**

1. (a) Give the design procedure of a compensating network for an OP-AMP which uses $\pm 10\text{V}$ supply voltages. Assume necessary data.
- (b) In the circuit of figure1 below, $R_1=100\Omega$, $R_F=4.7\text{K}\Omega$ CMRR=90 db. If the amplitude of the induced 60-Hz noise at the output is 5mv (rms), calculate the amplitude of the common-mode input voltage V_{cm} . [8+8]

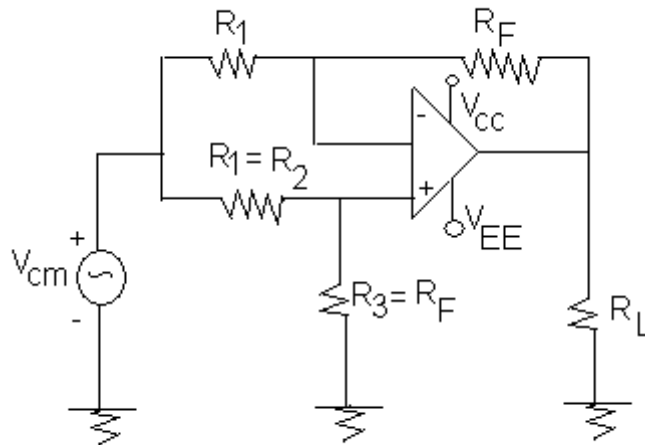


Figure 1:

2. (a) Draw the circuit and explain the working of
 - i. voltage to current converter,
 - ii. current to voltage converter. [2x4]
- (b) Draw a circuit using Op-Amp, which can work as adder (inverting and non-inverting) and explain how it works. [2x4]
3. (a) Describe the principle of operation of a precision half wave rectifier with wave forms. [6]
- (b) Draw a sample and hold circuit and explain its operation with necessary input and output waveforms and indicate its uses. [2+8]

4. (a) Draw the circuit of Schmitt trigger using 555 timer and explain its operation. [2+6]
(b) How is an Astable multivibrator using 555 timer connected in to a pulse position modulator? [8]
5. (a) Draw the circuit of a PLL AM detector and explain its operation.
(b) What is the major difference between digital and analog PLLs? [8+8]
6. (a) What are the advantages of active filters over passive ones?
(b) Design a second order low pass Butterworth filter for a cut off frequency of $2kHz$. Assume necessary data.
(c) What is an all pass filter? Draw the circuit of the filters. [5+6+5]
7. (a) Draw the schematic circuits of CMOS NAND and CMOS NOR gates and explain their functions with the help of Truth-Table.
(b) What are the advantages and disadvantages of CMOS over TTL gate?
(c) Which is the fastest saturated logic gate? And Why ? [6+5+5]
8. (a) Name various techniques used to convert digital data to analog data. Compare their merits and demerits.
(b) Draw the circuit diagram of a mostly used D/A converter and derive expression for output voltage for 4 bits. Sketch the analog output voltage for the given digital code. [8+8]
