

III B.Tech I Semester Regular Examinations, November 2005
LINEAR AND DIGITAL IC APPLICATION
(Common to Electronics & Instrumentation Engineering, Bio-Medical
Engineering, Electronics & Control Engineering, Mechatronics and
Electronics & Telematics)

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

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Derive the expression for CMRR for the first stage differential amplifier [8]
(b) Explain about any two linear and nonlinear applications of OP-AMP [8]
2. (a) Explain the differences between ac and dc amplifiers [6]
(b) What is instrumentation amplifier? What are its features? List any three applications of instrumentation amplifier. [10]
3. (a) Explain the principle of operation of IC723 general purpose regulator with neat block diagram. [10]
(b) Compare and contrast the performance of a BJT based OP-AMP and FET OP-AMP in detail. [6]
4. (a) Draw the circuit of Schmitt trigger using 555 timer and explain its operation. [8]
(b) How is an Astable multivibrator using 555 timer connected in to a pulse position modulator? [8]
5. (a) Draw the block diagram of 565 PLL and explain about each block. Make circuit connections to track the input signal and explain its operation. [8]
(b) Write short notes on :
 - i. PLL as frequency multiplier
 - ii. PLL as frequency translator.[8]
6. (a) Explain the operation of a delay equalizer circuit with neat sketches. Derive an expression relating input and output voltages of the equalizer. [8+2]
(b) For the all pass filter, determine the phase shift between input and output at $f=2$ kHz. To obtain a positive phase shift. What modifications are necessary in the circuit? [6]
7. (a) Draw a totem-pole output buffer with a TTL gate. Explain its operation. [8]
(b) What is meant by Wired-logic. Explain with the help of an example. [4]
(c) Why TTL passive pull-up circuit is not suitable for capacitive loads? Explain. [4]

8. (a) Explain the operation of the fastest analog to digital converter. What is the main draw back of this converter? Compare this converter with other types. [8]
- (b) Draw the circuit diagram sample and hold circuit and explain its working. [8]

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1. (a) Derive the expression for CMRR for the first stage differential amplifier [8]
(b) Explain about any two linear and nonlinear applications of OP-AMP [8]
2. (a) Draw the circuit diagram of a two input non inverting type summing amplifier and derive the expression for output voltage. [7]
(b) Briefly explain why negative feedback is desirable in amplifier applications [5]
(c) How does negative feedback affect the performance of an inverting amplifier? [4]
3. (a) Explain the function of a typical adjustable voltage regulator. How can you increase the current driving capacity of the regulator? [6]
(b) Describe the principle of working of a balanced modulator using OP-AMP. Also give the applications of it. [10]
4. (a) What are the two basic modes in which the 555 timer operates? Briefly explain the differences between the two operating modes of the 555 timer. [8]
(b) Design a ramp generator using 555 timer having an output frequency of approximately 5KHz . [8]
5. Define Lock range & Capture range. Why Lock range is usually greater than the capture range? [16]
6. (a) Explain the term "VSVS configuration". Design a VCVS low-pass Butterworth second order filter with a cutoff frequency of 4 kHz . Assume necessary data in the design process. [10]
(b) Design a second order IGMF band-pass filter with the following specifications : $f_o=500\text{ Hz}$; Gain at resonance=-5 and band-width= 50Hz . Use the circuit shown below (figure 1). Assume necessary data [6]

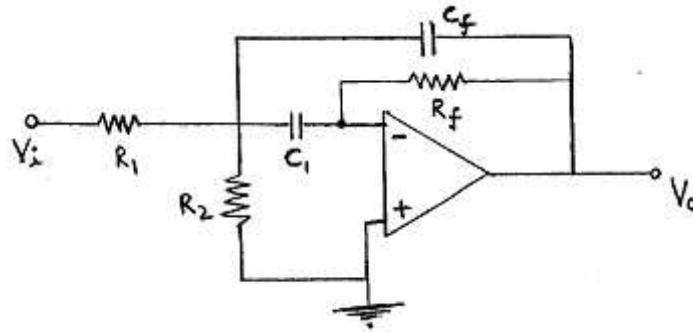


Figure 1:

7. (a) What is meant by Tri-state logic ? Draw the circuit of Tri-state TTL logic and explain its functions. [8]
- (b) Draw the circuit of ECL logic OR/NOR gate and explain its functions. [8]
8. (a) List out different types of A/D converters and compare their merits and demerits. [6]
- (b) Give the schematic circuit of integrating type A/D converter and explain the operation of this system and derive expression for output voltage V_o . [10]

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(b) Briefly explain why negative feedback is desirable in amplifier applications [5]
(c) How does negative feedback affect the performance of an inverting amplifier? [4]
3. (a) Derive the frequency of oscillation of a RC phase shift oscillator and explain the operation of the circuit. [12]
(b) Define supply voltage sensitivity. What is meant by poorly regulated power supply? [4]
4. (a) Give methods for obtaining symmetrical square wave using 555 timer. [8]
(b) Discuss any two applications of 555 timer in Monostable mode. [8]
5. (a) Draw the circuit of a PLL AM detector and explain its operation. [10]
(b) What is the major difference between digital and analog PLLs? [6]
6. (a) What are the advantages of active filters over passive ones? [5]
(b) Design a second order low pass Butterworth filter for a cut off frequency of $2kHz$. Assume necessary data. [6]
(c) What is an all pass filter? Draw the circuit of the filters. [5]
7. (a) Draw the schematic circuits of CMOS NAND and CMOS NOR gates and explain their functions with the help of Truth-Table. [8]
(b) What are the advantages and disadvantages of CMOS over TTL gate? [4]
(c) Which is the fastest saturated logic gate? And Why ? [4]
8. (a) Define the following terms as related to DAC [4]
 - i. Accuracy
 - ii. Resolution.
(b) Define the following terms as related to ADC [4]

- i. Conversion time
- ii. Percentage resolution.
- (c) Which type of DAC is more preferable? Draw the circuit diagram and obtain expression for output voltage for 4 bits. [8]

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1. (a) List out the ideal characteristics of an OP-AMP. [3]
(b) With neat block diagram explain the function of various building blocks of an OP-AMP. [10]
(c) Draw the equivalent circuit of an OP-AMP. [3]
2. (a) Draw the circuit diagram of a two input non inverting type summing amplifier and derive the expression for output voltage. [7]
(b) Briefly explain why negative feedback is desirable in amplifier applications [5]
(c) How does negative feedback affect the performance of an inverting amplifier? [4]
3. (a) Derive the frequency of oscillation of a RC phase shift oscillator and explain the operation of the circuit. [12]
(b) Define supply voltage sensitivity. What is meant by poorly regulated power supply? [4]
4. (a) Explain the significance of each of comparators and operation of 555 timer. [6]
(b) Explain the application of 555 timer as Linear ramp generator. [10]
5. (a) Explain the terms Lock range, Capture range and Pull-in time a PLL. How are Lock Range and Capture range determined? [8]
(b) Design a PLL circuit using IC 565 to get
 - i. Free-running frequency = 4.5 KHz
 - ii. Lock range of 2 KHz and
 - iii. Capture range = 100 Hz .Assume a supply voltage of + or - 10V. Show the circuit diagram with all component values. [8]
6. (a) Explain the operation of a delay equalizer circuit with neat sketches. Derive an expression relating input and output voltages of the equalizer. [8+2]
(b) For the all pass filter, determine the phase shift between input and output at $f=2\text{ kHz}$. To obtain a positive phase shift. What modifications are necessary in the circuit? [6]

7. (a) What is meant by Tri-state logic ? Draw the circuit of Tri-state TTL logic and explain its functions. [8]
(b) Draw the circuit of ECL logic OR/NOR gate and explain its functions. [8]
8. (a) Draw the schematic circuit diagram of a Servo A/D converter and explain the operations of this system. [8]
(b) Compare Servo A/D with other types of A/D converters. [8]
