

II B.Tech I Semester Supplementary Examinations, November 2006
LINEAR AND DIGITAL IC APPLICATION
(Common to Computer Science & Engineering, Information Technology
and Computer Science & Systems 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 [10]
(b) What are the differences between the inverting and non inverting terminals? What do you mean by the term "virtual ground"? [6]
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) What feedback is preferred for oscillators and why? What is the effect of negative feedback? [8]
(b) Design an OP-AMP based relaxation oscillator and derive the frequency of oscillation. [8]
4. (a) Explain the operation of Astable multivibrator using 555 timer. [10]
(b) Design a square waveform generator of frequency 1kHz and duty cycle of 75% using 555 timer. [6]
5. List the applications of IC 1496. Explain the application of IC 1496 as mixer circuit. [16]
6. (a) Explain the design procedure (with suitable circuit diagram of a fourth order Butterworth low-pass filter). [10]
(b) A certain narrow band-pass filter has been designed to meet the following specifications: $f_c = 2\text{kHz}$, $Q = 20$, 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? [6]
7. (a) Compare different logic families and mention their advantages and disadvantages? [8]
(b) Which is the fastest non-saturated logic gate ? Draw the circuit and explain its functions. [8]

8. (a) Draw the circuit of a Ladder type DAC for 4 bits and derive expression for output voltage. [8]
- (b) Sketch the Analog output voltage for the given digital code. [4]
- (c) Compare R-2R and Weight Resistor types of ADC. [4]

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1. (a) Discuss the electrical characteristics of an OP-AMP in detail. [10]
(b) Draw an ideal voltage transfer curve of an OP-AMP. [3]
(c) What are the features of IC 741? [3]
2. (a) Classify the types of OP-AMP based multipliers. How a multiplier can be used to [8]
 i. double the incoming frequency
 ii. detect the phase angle of a signal
(b) Design a subtractor in non inverting configuration [8]
3. (a) What feedback is preferred for oscillators and why? What is the effect of negative feedback? [8]
(b) Design an OP-AMP based relaxation oscillator and derive the frequency of oscillation. [8]
4. (a) Discuss any two applications of 555 timer in Monostable mode. [10]
(b) Design a Monostable multivibrator using 555 timer to produce a pulse width of 100 m sec. [6]
5. List one application of the PLL and then briefly describe the role of the PLL in that application. [16]
6. (a) Explain the term "Frequency Sealing" with suitable example. [6]
(b) Design a wide band-pass filter with $f_L=200Hz$. $F_H=1KHz$ and a pass-band gain=4. Draw the frequency response and calculate 'Q' factor for the filter. [10]
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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1. (a) What is an OP-AMP? Why it is called so? [4]
(b) Explain the parameters that should be considered for ac and dc applications of an OP-AMP [5]
(c) Draw and explain the three open loop OP-AMP configurations with neat circuit diagram [7]
2. (a) Classify the types of OP-AMP based multipliers. How a multiplier can be used to [8]
 i. double the incoming frequency
 ii. detect the phase angle of a signal
(b) Design a subtractor in non inverting configuration [8]
3. (a) What is a switching regulator? Draw the block diagram of a typical switching regulator and explain its operation. [8]
(b) What are the four types of voltage regulators? Compare the performance of these regulators. [8]
4. (a) Design a 555 Astable multivibrator to operate at 10 KHz with 40% duty cycle. [8]
(b) Explain in which the 555 timer can be used as Astable multivibrator [8]
5. (a) Draw the schematic circuit diagram of the following and explain their working. [12]
 i. Analog phase detector
 ii. VCO
 Derive necessary expressions.
(b) What is their role is in PLL? Explain. [4]
6. (a) Derive the transfer function for a general second order sallen-key filter with suitable circuit diagram. [8]
(b) Design a Butterworth filter for a given normalized polynomial of $S^2+1.414S+1$. Assume necessary data. [8]
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) i. Compare weighted resistor D/A converter and R-2R D/A converter.
ii. Why successive approximation D/A converter is preferable than parallel comparator A/D converter. Explain. [8]
- (b) Draw the schematic block diagram of Dual-slope A/D converter and explain its operation. Derive expression for its output voltage V_o . [8]

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(b) What are the differences between the inverting and non inverting terminals? What do you mean by the term "virtual ground"? [6]
2. (a) Derive the expression of the output voltage of an antilog amplifier using OP-AMP. [10]
(b) What is a summer? Design a summer to add 4 input voltages in inverting configuration. [6]
3. (a) With neat block diagram, explain the operation of a fixed voltage regulator. [8]
(b) Describe the operation of an IC based negative voltage regulator. Give few applications [8]
4. (a) Explain the operation of Monostable multivibrator using 555 timer. Derive the expression of time delay of a Monostable multivibrator using 555 timer. [10]
(b) Design a Monostable multivibrator using 555 timer to produce a pulse width of 100 m sec. [6]
5. (a) Give the block diagram of PLL and explain about each block in detail. [10]
(b) Define the following terms with reference to PLL
i. Lock range
ii. Capture range
iii. Pull-in-time. [6]
6. (a) Define Bessel, Butterworth and Chebyshev filters, and compare their frequency response. [8]
(b) Sketch the circuit diagram of band elimination filter and design a wide band-reject having $f_H=200\text{Hz}$ and $f_L=1\text{kHz}$. Assume necessary data. [8]
7. (a) When do we prefer H.T.L. (High-Threshold Logic) gate? And explain why ?
(b) Draw the Integrated circuit of H.T.L. 3-input NAND gate, and explain its operation with the help of Truth Table. [10]

- (c) Find out the average power dissipation of the gate. [2]
- 8. (a) List out and compare different types of A/D converters. [8]
- (b) Give the schematic circuit diagram of the fastest A/D converter and explain its operation. [8]
