EE6303-LINEAR INTEGRATED CIRCUITS AND APPLICATIONS

(Common to EEE & EIE- Third semester-Regulation 2013)

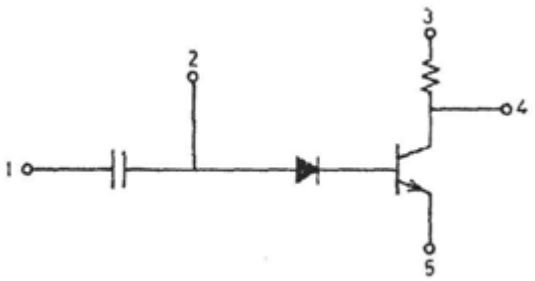
UNIT I IC FABRICATION

Part – A- Two marks questions

1. Give the difference between monolithic and hybrid ICs.
2. Classify IC.
3. What is lithography?
4. What are the advantages of integrated circuits over discrete circuits?
5. What is the difference between diffusion and ion implantation?
6. What is the purpose of oxidation process in IC Fabrication?
7. What are the advantages of integrated circuits over discrete circuits?
8. What is meant by ion implantation?
9. Write the basic chemical reaction in the epitaxial growth process of pure silicon
10. List the basic process used in IC fabrication
11. What is parasitic capacitance?
12. What are the popular IC packages available?
13. What is meant by dielectric isolation in I.C Fabrication? Mention its application and Limitations.
14. How surface layer of SiO_2 is formed?
15. What is meant by substantial diffusion?
16. What is the need for buried layer in fabrication of monolithic integrated transistor?
17. Differentiate between thin film and thick film technology in IC fabrication.
18. Define the term epitaxial growth.
19. Compare the performance of n-p-n and p-n-p transistors with respect to IC fabrication.

Part – B 16 marks questions

1. Explain the basic Process used in silicon planar technology with neat diagram. (16)
2. With respect to BJT based circuit given below, explain the various steps to implement the circuit into a monolithic IC. (16)



3. Briefly explain the various types of IC packages. Mention the criteria for selecting an IC package.
4. Write short notes on classification of IC.
5. With neat sketches explain the fabrication of diodes capacitors
6. Explain the various methods used for fabricating IC resistors and compare their performance
7. Explain about MOSFET fabrication
8. Write a note on CMOS technology.

UNIT II CHARACTERISTICS OF OPAMP

Part – A- Two marks questions

1. List out the ideal characteristics of OP AMP?
2. Define CMRR of an amp?
3. Define slew rate. What causes it?
4. List the methods used to provide the external frequency compensation.
5. Mention some of liner applications of OP AMP.
6. Why is RCOMP not needed in differential amplifier?
7. What are the merits and demerits of Dominant pole compensation method?
8. What happens when the common terminal of V+ and V- sources are not grounded?
9. What is meant by differential amplifier?
10. What is frequency compensation.
11. Design an amplifier with a gain of -10 and input resistance of 10k.
12. An input of 3v is fed to the non-inverting terminal of an op-amp. The amplifier has a Ri of 10KΩ and Rf of 10KΩ .Find the output voltage
13. What is voltage follower?
14. In practical op-amps, what is the effect of high frequency on its performance?
15. What is an opamp?
16. What is a precision diode ? Draw the Circuit diagram of an half wave precision rectifier with waveform.
17. Draw the circuit diagram of an op-amp integrator. Mention its application.
18. Compare ideal and practical characteristics of an op-amp.
19. Determine the input impedance of 741 operational amplifier employed as voltage follower having A_v =50,000 and R_i = 0.3MEGA OHM.
20. Draw the circuit diagram of differentiator using Op-amp.
21. The two input bias currents of an Op-amp are 22μA and 26 μA. What is the value of input offset current? Input bias current.?
22. Why operational amplifier configurations are not used in linear applications?

Part – B 16 marks questions

1. Explain the following terms in an OP-AMP.

Bias current (4)

Thermal drift (4)

Input offset voltage and current (4)

Thermal drift (4)

2. a. Draw the circuit of differential amplifier and derive the expression for output voltage in it. (8)

b. With neat diagram explain the working of an OP-AMP base integrator. (8)

3. With neat circuit diagram explain the operation of a OP-AMP differentiator and derive and expression for the output of a practical differentiator. (16)

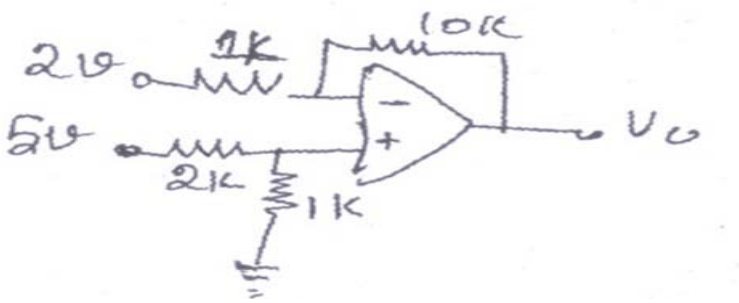
4. Explain the frequency compensation techniques of OP-AMP. (16)

5. Draw the circuit of a symmetrical emitter coupled differential amplifier and derive for CMRR. (16)

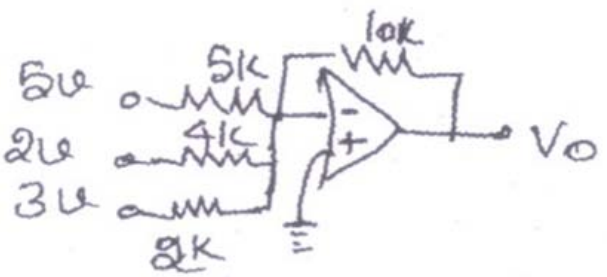
6. Show the help of circuit diagram an OP-AMP used as a. i)Summer (8)

b. II) Integrator and explain their operation. (8)

7. Find Vo of the following circuit (8)

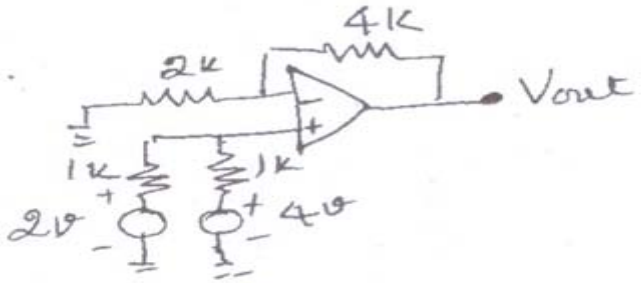


8. Find Vo of the following circuit (8)



10.Write a technical note on frequency response characteristics of differential amplifier. State the importance of frequency compensation.(10)

11.Determine the output voltage for the circuit shown in figure.(6)



12. Explain various DC and AC characteristics of an op-amp. Distinguish between ideal and practical characteristics. (12)

13. Determine the output voltage of the differential amplifier having input voltages V_1=1mV and V_2=2 mV. The amplifier has a differential gain of 5000 and CMRR 1000.

14.Design a OP-Amp circuit to give an output (8)

$V_0=V_1-2V_2+2V_3-3V_4$

15.Draw the Schematic block diagram of the basic OPAMP. Explain the Significance of virtual ground in basic inverting OPAMP. How would you explain its existence? (16)

16. What is a voltage Curve transfer curve of an OPAMP. Explain Why open loop configurations are not used in linear applications. (10)

17. With circuit and waveforms explain the application of OPAMP as (1) Integrator (2) Voltage series Feedback Compensation.

18. Design an op-amp differentiator that will differentiate an input signal with fmax = 100 Hz. (8)

19. Draw the output waveform for a sine wave of 1v peak at 100 Hz applied to the differentiator. (4)

20. (a) Repeat part (b) for a square wave input. (4)

UNIT III APPLICATIONS OF OPAMP

Part – A- Two marks questions

1. What is meant by cut off frequency of a high pass filter and how it is found out in a first order high pass filter?
2. What is meant by resolution of an ADC?
3. What are the applications of peak detectors?
4. Why active filters are preferred?
5. Draw the circuits of I to V converter using op-amp.
6. Define monotonicity with respect to Data converters.
7. Give any 4 applications of a comparator.
8. What is a zero crossing detector?
9. Mention the types of DACs Techniques?
10. Where do we use successive approximating type ADC?
11. Draw a peak detector using op-amp
12. Draw the circuit diagram of sample and hold circuit.
13. Mention the applications of an instrumentation amplifier.
14. Which is the fastest ADC? Why?
15. Sketch the circuit of an op-amp employed as,a non-inverting zero crossing detector, along with input and output waveforms.
16. What are the basic requirements of a good instrumentation amplifier?
17. What are the advantages of active filters?

Part – B 16 marks questions

1. Explain the working principle of RC phase shift sine wave generator using OP-AMP and derive the expression for 'f'. (16)
2. With an example and diagrams explain the working principle of successive approximating type ADC and also explain the important DAC specifications. (16)
3. Draw the circuit of instrumentation amplifier and derive the expression for output voltage for in it. Also write the advantages of instrumentation amplifier. (16)
4. Explain the following application of operational amplifier.
   (1) peak detector
   (2) Functions of flash type A/D converter.

5. With neat diagram, explain the working principle of
   (a) R-2R ladder type DAC (8)
   (b) Weighted resistor DAC (8)

6. (a)Explain the operation of Schmitt trigger. (8)
   (b)Write a note on V/I and I/V converter. (8)
7. Draw the circuit of a second order Butterworth low pass filter and derive its transfer function. (16)
8. Explain the operation of dual slope ADC. (10)
9. Draw the circuits of Monostable multivibrator and obtain expression for pulse width T.
10. A dual slope ADC uses a 16-bit counter and a 4MHz clock rate. The maximum input voltage is +10v. The maximum integrator output voltage should be -8v when the counter has cycled through 2^n counts. The capacitor used in the integrator is 0.1 μF. Find the value of the resistor R of the integrator. (6)
11. (a) Design a low pass filter with a cut off frequency of 1 kHz and with a pass band gain of 2. (8)

UNIT IV SPECIAL ICs

Part – A- Two marks questions

1. In what way VCO is different from other oscillators.
2. Mention any two application of 555 Timer in Mono stable mode.
3. What is meant by capture range in a PLL?
4. If the supply voltage (Vcc) to 555 timers is 10V, find the minimum and maximum value of the voltage across the capacitor connected to trigger input, when it is configured in Astable mode.
5. What are the different stages of operation in a PLL?
6. A 10 bit A/D converter has an input voltage of -10 to +10 v. Find resolution.
7. Why V_{CO} is called voltage to frequency converter?
8. With reference to a VCO, define voltage to frequency conversion factor K_V .
9. Define: lock range
10. State why the phase detector output in a PLL should be followed by a low pass filter.
11. List the applications of NE565.
12. Draw the relation between the capture range and lock range relationship in a PLL.
13. Draw the pin diagram of IC 555 timer.
14. Mention any two applications of multiplier IC.
15. What are one, two and four quadrant multipliers?
16. Mention the application of Analog multiplier.
17. Draw the block diagram of PLL as frequency multiplier.
18. Enlist the important features of 555 timer circuit.
19. Determine the output pulse width of the monostable amplifier using 555 timer if R=10 kilo Ohm and C=0.01 microfarad.
20. Define PULL time of PLL.

Part – B 16 marks questions

1. Explain the operation of 555 Timer in astable mode with neat circuit and wave forms. Derive the expression for frequency of output voltage in it. (16)
2. Describe the application of PLL for frequency multiplication and amplitude modulation detector with neat diagrams. (16)
3. Explain schematic how PLL can be used as (a). Frequency multiplier (8)
   (b). frequency translator. (8)
4. Design and draw the wave forms of 1KHZ square wave form generator using 555 Timer for duty cycle i) D=25% ii) D=50% (16)
5. Perform the closed loop analysis of PLL. Explain any two application of PLL. (16)

6. Explain the Astable operation a 555 Timer IC with application. (16)

7. (i) Explain the operation of PLL. (16)

(ii) Discuss the application of PLL as frequency synthesizer

8. (i). Briefly explain the difference between the two operating mode of 555 Timer(10)

(ii). List the Important feature of 555 Timer (4)

9. (i) Briefly explain the Functional block diagram of PLL IC 565. (10)

(ii) Write a note on Analog Multipliers (6)

10. With block diagram explain the principle of operation of NE565 Phase Locked loop.(16)

11. Describe the Working of VCO

12. Design a 555 based square wave generator to produce an asymmetrical square wave of 2 KHz. If Vcc=12V, draw the voltage curve across the timing capacitor and output waveform.

13. Explain the voltage controlled oscillator with a neat block diagram. Give its typical connection diagram and its output waveforms. (16)

14. Explain the asbable and bistable operation of IC 555 with necessary waveforms. (16)

UNIT V APPLICATION ICs

Part – A- Two marks questions

1. Differentiate between linear and switching regulator.
2. Write the expression for output voltage in LM317.
3. What is an opto coupler? Mention any one of its application.
4. Why do switching regulators have better efficiency then the series regulator?
5. What is an isolation amplifier?
6. Name the various protection circuits used for voltage regulators.
7. Name two application of isolation amplifier.
8. What is the need for voltage regulation?
9. List the characteristics of opto coupler.
10. Define ripple rejection with respect to voltage regulators.

Part – B 16 marks questions

1. Explain the internal structure of voltage regulator IC 723. Also draw a low voltage Regulator circuit using IC 723 and explain its operation. (16)
2. Explain the construction and working principle of function generator IC ICL 8038. (16)
3. Draw and explain the functional block diagram of a 723 voltage regulator and how this IC can be used as High voltage regulator. (16)
4. Write an explanatory note an:
   a. Power amplifier (8)
   b. Isolation amplifiers (8)
5. Write short notes on:
   a. Opto couplers. (8)
   b. Switching regular. (8)
6. Briefly explain the working principle of switch mode power supply with necessary circuit diagrams and wave forms. (16)
7. What are feature of LM 380 power amplifier? With a schematic explain its application as high gain audio power amplifier.
8. Write short notes on protective circuits in regulators.