

## QUESTION BANK

**DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING**

Subject Code : EC1254

Subject Name : Linear Integrated Circuits

Year/Sem: II / IV

### **UNIT I      IC FABRICATION AND CIRCUIT CONFIGURATION FOR LINEAR IC's**

#### **PART-A**

1. Define Current mirror and current sources,
2. List out the ideal characteristics, and draw the equivalent diagram of an OP-AMP
3. Define Virtual ground property of an OP-AMP
4. Draw the voltage follower circuit of an OP-AMP
5. Define the parameters as applied to an op-amp Input bias current
6. Define Input offset current and offset voltage
7. Define Voltage sources
8. Define voltage reference
9. Define C.M.R.R
10. What is P.S.R.R?
11. Define slew rate
12. Why open loop op-amp configurations are not used in linear applications?
13. In response to a square wave input, the output of an op-amp changed from -3V to +3V over a time interval of 0.25 $\mu$ s.
14. What is active load ? Where it is used and why?
15. Determine the value of the resistance required for the Wilder current mirror shown in the figure, if the reference current is 1 mA and the control current ( $I$ ) is 10 $\mu$ A.
16. What is the difference between the open loop and close loop gain of an op-amp.
17. List out the advantages of IC over discrete component circuit
18. Explain the word Epitaxy.
19. Draw the two different diagrams of differential amplifier
20. What is a thin film capacitor .
21. What is the different linear IC packages?
22. What is meant by BIMOS or BIFET amplifier?
23. What is a VBE multiplier?
24. What is practical op-amp? And an op-amp?
25. Define Thermal Drift?

## **PART-B**

1. Explain the different method of current sources
2. Write a note on Wilder biasing and Wilson current source circuit.
3. Explain the various circuits used to provide constant current bias in a differential amplifier.
4. Explain the method of improving the CMRR using active load .
5. Explain the operation of differential amplifier and give its differential gain, Common mode gain and CMRR.
6. Draw and explain the basic band gap reference circuit.
7. Derive the slew rate equation for an op-amp.
8. Explain in detail about the frequency compensation applied to operational amplifiers.
9. Explain the voltage source and reference
10. Draw and explain briefly the equivalent circuit of an op-amp.
11. Draw and explain the internal block diagram of IC 741.
12. Explain about the DC Characteristics ?
13. Explain about the AC Characteristics?
14. Explain the inverting and Non inverting terminal ?
15. Write the explanation General operational amplifier

## **UNIT II      APPLICATIONS OF OPERATIONAL AMPLIFIERS**

### **PART-A**

1. Define the capture range?
2. What is Adder and Subtractor
3. Draw the phase shift Circuit
4. What is Voltage follower
5. Define the scale Change?
6. Write the equation of V to I and I to V
7. Define the Instrumentation amplifier
8. What is Differentiator/
9. Write the types of Differentiator
10. Define Comparator
11. Give some applications of Comparator

12. What is a window detector?
13. What is hysteresis? What parameter determine the hysteresis?
14. List the types of comparators
15. State the conditions for oscillations
16. Differentiate Schmitt trigger and comparator
17. What are the limitations of an ideal active differentiator.
18. What is clipper and Clamper
19. Using an op-amp draw the circuit diagram of a phase shift oscillator.
20. Write the definition of peak detector
21. How do the precision rectifier differ from the conventional rectifier.
22. What are the advantages of active filters over the passive filters?
23. Draw the freq. response of the LPF, HPF, BPF & BSF.
24. For a square wave oscillator calculate the frequency of oscillation if  $R_2=10k, R_1=8.6k, R_f= 100k$  &  $C= 0.01$
25. Define Logarithmic amplifier – Antilogarithmic amplifier

### **PART-B**

1. Design a fourth order Butterworth LPF having a upper cutoff frequency of 1 KHz.
2. Design a square wave oscillator for  $f_0 = 1$  KHz using 741 op-amp and a DC supply voltage of  $\pm 12V$ .
3. Discuss the working of instrumentation amplifier . Name two applications of the same.
4. An input dc voltage shown in figure is fed to an op-amp integrator with  $RC = 1$  sec. Find the output and sketch. Op-amp is nulled initially .
5. Discuss in detail the working of a RC phase shift oscillator.
6. Design Wien Bridge oscillator of 1 KHz frequency.
7. Design an op – amp Schmitt trigger with  $V_{UT}= 2V, V_{LT}= -4V$  & the output swings b/w  $\pm 10V$ . If the i/p is  $5 \sin \omega t$  , plot i/p & o/p waveforms.
8. Compare the RC phase shift and Wien bridge oscillator.
9. Design a RC phase shift oscillator and a Wine bridge oscillator of frequency 1 KHz. (Assume  $C= 0.01$  )
10. Draw and Explain about the V to I and I to V
11. Detail Explain about the instrumentation amplifier
12. Explain about the integrator and Differentiator
13. Derive the Logarithmic amplifier – Antilogarithmic amplifier
14. Explain about the clipper and clamper
15. Draw and the detail about the Schmitt trigger
16. Briefly explain about the fiilters

## UNIT III ANALOG MULTIPLIER AND PLL

### PART-A

1. What is analog multiplier
2. Draw the circuit of the emitter coupled transistor pair of analog multiplier
3. List out the blocks of a PLL.
4. Define the free running mode
5. Define capture range
6. Define lock range.
7. Define pull in time
8. Define pull out range
9. Define pull in range
10. What is major different between digital and analog PLLs ?
11. When will the switch type phase detector produces an error voltage of zero volts.
12. What are the drawbacks of switch type phase detector .
13. Compare the edge triggered phase detector and the EX-OR phase detector.
14. Draw the types of low pass filter circuits involved in PLL .
15. Write the expression of FSK modulation
16. Define free running mode
17. Define voltage to frequency conversion factor of VCO.
18. Draw the diagram of VCO
19. Draw the diagram of PLL
20. Mention the applications of analog multipliers.
21. List out the applications of PLL.
22. Define phase transfer conversion coefficient of PLL.
23. List out the applications of PLL for AM detection
24. List out the applications of PL for FM detection.
25. Write short notes on demodulation and frequency synthesizing.

### PART-B

1. Draw and explain the block diagram of PLL IC 565.
2. Draw and explain the operation of VCO IC 566 and derive the expression for  $f_o$ .
3. Derive the expression for capture range and lock range of PLL.
4. Derive the expression for voltage to frequency conversion factor of VCO.
5. Explain the application AM detector and FSK demodulator using PLL.

6. Explain various types of phase detectors used in PLL.
7. Explain the application frequency synthesizer using PLL.
8. What are the function of LPF in PLL.
9. Write the explanation of Analog multiplier using emitter
10. Explain about the Gilbert multiplier cell
11. Explain demodulation and frequency synthesizing.
12. Write application of PLL for AM detection – FM detection
13. Write the explanation of FSK modulation
14. Explain Monolithic PLL IC 565
15. Write the operation of the basic PLL

## **UNIT IV ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTERS**

### **PART-A**

1. Name the essential parts of a DAC
2. Classify DACs on the basis of their output
3. Explain the operation of basic sample and hold circuit.
4. Define performance parameters of D/A converters Resolution
5. Define Accuracy
6. Define Monotonic
7. Define Conversion time
8. State the advantages and applications of sample and hold circuits.
9. List the drawbacks of binary weighted resistor technique of D/A conversion.
10. Explain the with reference of ADC of Conversion time
11. Explain the operation of dual slope ADC
12. Explain the important specifications of D/A and A/D converters
13. Explain Resolution time
14. Explain Quantization time
15. What is the advantage and disadvantages of flash type ADC.
16. The basic step of a 9 bit DAC is 10.3 mV. If 00000000 represents 0Volts, what
17. is the output an input of 101101111?
18. Why does the dual slope ADC provide excellent noise rejection of AC signal
19. whose periods are integral multiples of the integration time?
20. Find the resolution of a 12 bit DAC converter.
21. Draw the monolithic sample and hold IC.
22. What are the advantages and disadvantages of R-2R ladder DAC.
23. Define start of conversion and end of conversion.
24. What are the types of ADC and DAC.
25. What is the difference between direct ADC and integrating type ADC.

## PART-B

1. Draw and explain the operation of sample and hold circuits.
2. Explain the operation of voltage to time converter.
3. Explain delta sigma modulation with required diagram.
4. Explain the principle of operations in ADC.
5. Draw and Explain Single slope ADC converter.
6. Briefly Explain about Dual slope ADC converter.
7. Draw and explain the functional diagram of the successive approximation ADC converter
8. Explain the operation of R-2R ladder type DAC and the weighted resistor type DAC.
9. A dual slope ADC uses a 16 bit counter and a 4 MHz 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  $0.1\mu F$ . Find the value of the resistor  $R$  of the integrator. If the analog signal is  $= 4.129 V$ , find the corresponding binary number.
10. Draw the circuit diagram of a 6-bit inverted R-2R ladder DAC and For  $V(I) = 5 V$  What is the maximum output voltage ? What is minimum voltage that can be resolved?
11. What is the conversion time of a 10-bit successive approximation A/D converter if the input clock is 5 MHz
12. What is the fastest ADC and why?
13. How many levels are possible in a two bit DAC? What is its resolution if the output range is 0 to 3v
14. Draw and Explain Weighted resistor type ADC converter
15. Draw and Explain ADC converter
16. Draw and Explain Flash type and Single slope type

## **UNIT V WAVEFORM GENERATORS AND SPECIAL FUNCTION ICs**

### **PART-A**

1. What are the operating modes of a 555 timer?
2. List out the applications of 555 timer?
3. Define sink current and source current?
4. Define normally ON load and normally OFF load?
5. What is the use of reset pin of 555 timer?
6. What is the purpose of control voltage pin(5) of 555 timer?
7. List out the major blocks of 555 timer functional diagram?
8. Define duty cycle?
9. Write the definition of Sine-wave , Multivibrators and triangular ?
10. Draw the IC 723 general purpose regulator
11. Write the expression for total time period of 555 timer in astable mode?
12. What is the frequency of oscillation of free running mode of 555 timer?
13. Draw the circuit of 555 timer in astable mode to achieve 50% duty cycle
14. List out the applications of 555 timer in astable mode
15. List out the applications of 555 timer in monostable mode
16. Define voltage regulators and give the types?
17. What do you mean by linear voltage regulators?
18. Define switched voltage regulators?
19. Draw the positive fixed voltage regulators using 7805?
20. What are the advantages of adjustable voltage regulators over the fixed voltage regulators?
21. List out the parameters related to the fixed voltage regulators?
22. Define dropout voltage of a fixed voltage regulator?
23. What is meant by opto couplers?
24. What is Video amplifier and Isolation amplifier?
25. What is meant by Multivibrator?

### **PART-B**

1. Explain in detail the function of 555 timer in astable mode and derive the expression for frequency of oscillation.
2. Explain in detail the function of 555 timer in monostable and derive the expression for frequency of oscillation.
3. Briefly explain about Multivibrators and draw
4. Derive and explain about triangular wave generator
5. Draw the internal functional diagram of 555 timer and explain briefly about each pin .
6. Draw and explain the astable operation using 555 to achieve 50% duty cycle and derive the expression for the frequency of Oscillation.

7. Write a short notes on Opto couplers?
8. Design a adjustable voltage regulator using IC 723 to obtain positive low voltage and high voltage.
9. Explain briefly about Power amplifiers
10. Explain briefly about Tuned amplifiers
11. Explain briefly about Video amplifiers
12. Explain about Square wave generator.
13. Explain about monostable Multivibrator.
14. Explain about Astable multivibrator.
15. Explain about Single tuned amplifier.