

## II YEAR / IV SEM

# LINEAR INTEGRATED CIRCUITS

### ONE MARKS QUESTION AND ANSWERS

#### UNIT-I

##### 1. What is op-amp?

An operational amplifier is a direct coupled high gain negative feedback amplifier. It can amplify the signals having the frequency range from 0 Hz to 1MHz.

##### 2. Define input off-set voltage?

This is the input voltage which must be applied between the input terminals to obtain zero output voltage.

##### 3. Define CMRR?

CMRR is the ratio of differential voltage gain ( $A_d$ ) to common mode voltage gain ( $A_{cm}$ ).

$$CMRR = A_d / A_{cm}$$

##### 4. What is virtual ground?

In op-amp, the inverting terminal is not directly connected to ground, but it acts like a ground terminal. therefore the inverting terminal is said to be at virtual ground.

##### 5. Draw the symbol of an op-amp?

##### 6. Define input bias current.

Input bias current is the average of the currents that flow into the inverting and non-inverting input terminals of a balanced operational amplifier.

##### 7. What is Sign changer?

A circuit which produces an output signal with the same magnitude of the input signal but out of phase is called sign changer.

$$V_o = -V_i$$

##### 8. What is IC?

The integrated circuit (IC) is a miniature, low cost electronic circuit consisting of active and passive components; they are joined together on a single crystal chip of silicon.

##### 9. How is IC classified according to their function?

#### INTEGRATED CIRCUITS

Monolithic Circuits

Hybrid circuits

Bipolar Unipolar

PN junction Dielectric MOSFET JFET

Isolation isolation

##### 10. Mention any one advantage of IC over discrete components.

❖ As the numbers of components are fabricated on a single silicon wafer, the weight of IC is very low.

❖ ICs operate at low voltages, so the power consumption of ICs is very low.

**11. Mention any two types of IC packages?**

- ❖ For TH mounting the standard packages are DIP (dual in line package) and PGA (pin grid array)
- ❖ For small scale integration (SSI) and medium scale integration (MSI) the different packages available are SIP (single in line package), ZIP (zig-zag in line package) and QIPC (quad in line package) with TM mounting type.
- ❖ For low pin counts, the package available are SO (small out line package) and SSOP (shrink small out line package). Both these are with SM mounting type.

**12. Mention any two characteristics of ideal op-amp?**

- ❖ High input impedance,  $R_i = \infty$
- ❖ Low output impedance,  $R_o = 0$

**13. Mention the pin numbers 2 and 3 of op-amp IC 741.**

- ❖ Pin no 2: Inverting input
- ❖ Pin no 3: Non-inverting input

**14. What is inverting amplifier?**

The input voltage is amplified in accordance with the values (ratio) of  $R_f$  and  $R_i$ , and also inverted.

**15. What is differential amplifier?**

Differential amplifier will amplify the difference between the two input signals.

**16. Define  $i/p$  offset current?**

It is the difference between the two input currents entering the two input terminals of a balanced operational amplifier.

**17. Define SVRR?**

SVRR is the ratio of the change in input offset voltage to the corresponding change in one power supply voltage with all remaining power voltages held constant.

**18. Define slew rate?**

It is defined as the maximum rate of change of output voltage per unit of time. It is expressed in volts per microsecond.  
 $SR = \frac{dV_o}{dt}$  at maximum  $v/\mu s$

**19. Define scale changes.**

In scale changer, the output is some constant factor multiplication (or division) of input signal.  
 $V_o = -k v_i$

**20. Define output offset voltage.**

It is the output voltage present, when the two input terminals are grounded.

**UNIT-II**

**1. What are zero crossing detectors?**

In this circuit, the output will change from one state to another very rapidly every time when the input signal passes through zero.

**2. Give one application of comparator?**

The main application of comparator is converting a sine wave signal into a square wave signal.

**3. What is an integrator?**

An integrator circuit integrates the input signal with respect to time. (frequency).

**4. Draw the circuit of multiplier using op-amp?**

A multiplier multiplies the input voltage to a particular amount.

**5. What is voltage follower?**

The output voltage follows the input voltage. The voltage follower is also called unity gain amplifier.

**6. What is comparator?**

The comparator compares two input voltages and produces output based on the inputs.

**7. What is instrumentation amplifier?**

In analog instrumentation, the transducers are required to measure and control physical quantities. The output of transducers has to be amplified, so that it can drive the indicator or display system. For doing this, an instrumentation amplifier may be used.

**8. What is summing amplifier?**

A three input summing amplifier is identical as with the circuit of an Adder. The output is the amplification of sum of input signal voltages..

**9. What is voltage to current converter called?**

The voltage to current converter is called as trans conductance amplifier.

**10. Mention two types of waveform generators by using opamp?**

Square wave generator triangular wave generator ,sine wave generator etc.

**11. What is adder?**

An adder is an arithmetic circuit. The amount of voltage produced at the output of adder is equal to the algebraic sum of input signal voltages.

**12. Define multiplier?**

Multiplier is the application of inverting amplifier. It multiplies the input voltage to a particular amount.  
 $V_o = -M V_i$

**13. Give the output voltage of adder?**

$$V_o = -(v_1+v_2+v_3)$$

Now the output voltage  $v_o$  is the sum of input signal voltages ,called adder.

**14. Define divider?**

Divider is also the application of inverting amplifier. A divider divides the input voltage to a particular amount.  
 $V_o = -V_i / D$

**15. What is differentiator?**

Differentiator circuit produces the output signal, which is the derivative of input signal  $v_i$ .

**16. Give any 3 features of instrumentation amplifier?**

- ❖ High gain accuracy
- ❖ High CMRR
- ❖ High gain stability

**17. Give the advantage of sine wave generator.**

- ❖ The circuit is simple to design.
- ❖ Can produce output over audio frequency range
- ❖ Produces sinusoidal output waveform
- ❖ It is a fixed frequency oscillator

**18. Give the frequency of oscillation of triangular wave generator.**

**19. What is waveform generators ?**

Wave form generators produce various waveforms such as square,triangular,sawtooth, sine wave etc. It produce a time dependent signals with required frequency, amplitude and wave shape.

**20. What is current to voltage converter?**

The output voltage is proportional to the input current and the circuit works as current to voltage converter. It is also called as trans resistance amplifier.

**1. What is VCO?**

The Voltage Controlled Oscillator is an oscillator whose frequency of oscillation varies in response to an input voltage.

**2. Define lock range in PLL.**

The range of frequencies over which the PLL can maintain lock with the incoming signal is called lock-in range or tracking range.

**3. What is the advantage of monolithic PLL over discrete PLL?**

Monolithic PLL is inexpensive compared with discrete PLL.

**4. What are the basic building blocks of PLL?**

The important components of PLL are phase detector, low pass filter, Error amplifier and voltage controlled oscillator .

**5. What is PLL?**

The phase locked loop (PLL) is an important building of linear systems. It is basically a closed loop system. It is commonly abbreviated as PLL.

**6. Define capture range in PLL.**

The signal ( $V_e$ ) shift VCO frequency in a direction towards the signal input frequency  $F_s$ . Once this action starts, we say that the signal is in the Capture range.

**7. State any two applications of PLL.**

❖ Frequency translation    ❖ Frequency multiplication

**8. What is IC 565?**

PLL 565 is available as 14 pin DIP package and as 10 pin metal can package.

**9. Mention the basic components of PLL.**

It consists of phase detector, an amplifier, low pass filter and VCO.

**10. Define VCO.**

A voltage controlled oscillator is an oscillator whose frequency of oscillation varies in response to an input voltage.

**11. What is the use of LPF used in PLL?**

The LPF not only removes the high frequency components and noise, but also controls the dynamic characteristics of the PLL. These characteristics include capture and lock range bandwidth and transient response.

**12. Define VCO IC566,**

IC 566 is a common type of VCO available in IC form. It is an 8 pin IC, which provides two output pins. Its feature is that it simultaneously produces square and triangular wave outputs.

**13. Give the frequency of o/p waveform of VCO 566.**

The frequency of output waveform is,  $F_0 = \frac{1}{2(C_T R_T)} (V_{CC} - V_C)$

**14. Give the 2 type of phase detector.**

1. Analog    2. Digital

**15. Give the applications of PLL.**

The PLL's are used in applications such as frequency synthesis, frequency modulation /demodulation, AM detection, tracking filters, FSK demodulation, tone detection etc.

**16. Define pull-in time.**

The total time taken by the PLL to establish lock is called pull-in time.

**17. Give the purpose of VCO output in PLL.**

The VCO output can be used for regenerating or reconditioning a desired frequency signal out of many undesirable frequency signals.

**18. Give the two output pins of PLL 565.**

Pin no: 7 Demodulated output    Pin no: 6 Reference output

## UNIT IV

### **1. What is D/A conversion?**

The process of changing the digital signal to an equivalent analog signal is accomplished by the use of D/A converter.

### **2. Define accuracy in ADC.**

The accuracy of a D/A converter is a measure of the difference between the actual output voltage and the expected output voltage. It is specified as a percentage of full-scale or maximum output voltage.

### **3. What is sample & hold circuit?**

During ADC the sample & hold circuit is used to sample an analog input voltage for a very short period of time and to hold the analog voltage constant while the conversion takes place.

### **4. Mention the types of DAC.**

- i) Weighted Resistor (summing amplifier) D/A converter
- ii) R/2R ladder network D/A converter

### **5. How many comparators are required for a 3-bit simultaneous type ADC?**

7- comparators

### **6. Define monotonicity in DAC.**

A D/A converter is said to be monotonic if its output voltage increases regularly as its binary digital input signal is increased from one value to the next value.

### **7. What is quantization?**

It is the process of mapping (dividing) an analog signal into several equivalent discrete levels (ranges or steps). That means, it is the process of converting a continuous input value to a discrete output value.

### **8. Mention any two types of ADC.**

Direct type ADCs

- i) Flash type ADC
- ii) counter type ADC

Integrating type ADC

- i) Charge balancing ADC
- ii) Dual slope ADC

### **9. Give one advantage of ramp type ADC.**

Advantage of ramp type ADC

- i) High resolution .
- ii) simple, since the conversion time is longer

### **10. Mention the output voltage of N bit weighted resistor DAC.**

### **11. What is analog to digital conversion?**

The process of converting an analog signal into an equivalent digital signal is known as analog to digital (A/D) conversion.

### **12. What is resolution in DAC?**

This is the smallest possible change in output voltage as a fraction or percentage of the full-scale output range

### **13. Define accuracy in DAC?**

The accuracy of a D/A converter is a measure of the difference between the actual output voltage and the expected output voltage. It is specified as a percentage of full-scale or maximum output voltage.

### **14. What is conversion time in ADC?**

The time interval between the end of the start signal and end of conversion is called conversion time.

### **15. Mention the various specifications of ADC.**

The following specifications are usually specified by the manufacturers of A/D converter. They are

- (i) Range of input voltage      (ii) Input impedance      (iii) Accuracy      (iv) conversion time

**16. Which type of conversion technique is used in ADC 0808?**

The 8 bit A/D converter uses successive approximation as the conversion technique.

**17) What is the use of sample and hold circuit?**

When an analog voltage is directly connected to the input of an ADC, the conversion process can be affected if the analog voltage is changing during the conversion time. The analog voltage is changing during the conversion time. The stability of the conversion process can be improved by using a sample and hold circuit.

**UNIT-V**

**1. What is IC 555?**

The timer IC 555 is most versatile linear integrated device introduced by signetics corporation in early 1970s.

**2. What are the uses of IC 555?**

IC 555 timer integrated circuit can be used to generate stable time delays like monostable multivibrator, or it may be used as an oscillator like an astable multivibrator.

**3. How many stable states are there in an astable multivibrator?**

An astable multivibrator contains no stable states, hence both states are quasi-stable states.

**4. What is a monostable multivibrator?**

A monostable multivibrator contains only one stable state and the other state is a quasi-stable state.

**5. What type of multivibrator is used in timer circuits?**

Monostable multivibrator & astable multivibrator are used in timer circuits.

**6. Mention two types of positive voltage regulator IC's.**

The IC voltage regulators are divided into the following three types.

(i) Three terminal fixed-voltage regulator

For both positive and negative voltages

(ii) Adjustable output voltage regulators      (iii) Precision voltage regulators.

**7. Mention the two important sections of IC 723.**

It has two separate sections. They are,

i) Zener diode and constant current source      ii) Reference amplifier

**8. Draw the pin diagram of IC 555.**

Pin No 1. Gnd, 2. Trigger, 3. Output, 4. Reset, 5. Control Voltage, 6. Threshold, 7. Discharge, 8. Vcc

**9. What is 78XX IC?**

IC 78XX is a positive voltage regulated IC. This is an example for three terminal positive voltage regulators, which provide fixed voltages from +5V to +24V.

**10. Which IC is used as a general purpose voltage regulator?**

IC 723 is a popular general purpose precision voltage regulator.

**11. What is a regulator?**

An IC regulator provides very precise regulation of output voltage for both line and load variations.

**12. Give two applications of IC 555.**

- i) Astable multivibrator      ii) Monostable multivibrator      iii) Schmitt trigger  
iv) sequence time

**13. What is Schmitt trigger?**

Schmitt trigger is a type of multivibrator. It converts the slowly varying input signal into a square or rectangular signal.

**14. What is IC 723?**

IC 723 is a popular general purpose precision regulator. It is a monolithic linear integrated circuit, available in different physical packages.

**15. Write the duty cycle of Astable multivibrator.**

Duty cycle  $D = \frac{R_A}{R_A + 2R_B} \times 100\%$

**16. What is the time period of quasistable state of monostable multivibrator using IC 555?**

$T = 1.1 RC$  sec

**17. Give the series of fixed negative voltage regulators.**

IC part number    Regulated positive voltage (V)    Minimum

$V_{in}$  (V)

7805    +5    7.3

7806    +6    8.35

7905    -5    -7.3

7906    -6    -8.4

**18. Give any two features of IC 723.**

- i) 150mA output current without external pass transistor.
- ii) output current excess of 10A possible by adding external transistors.
- iii) Input Voltage 40V max.

**19. What is pin no 1 & 2 of IC 555 timer.**

Pin no 1: Ground terminal      Pin no 2: Trigger terminal

**20. What is control voltage terminal in IC 555 timer circuit?**

**Control voltage terminal:** This terminal is used to change the threshold and trigger voltage levels. usually a 0.01F capacitor is connected to it, for suppressing supply voltage noises and ripple voltages

*BEST OF LUCK*