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Sevalpatti (P.O), Sivakasi - 626140. Tamilnadu.

DEPARTMENT OF ELECTORNICS & COMMUNICATION ENGINEERING

SUBJECT CODE / NAME: 231EC41 LINEAR INTEGRATED CIRCUITS

YEAR/SEM: II YEAR / IV SEMESTER

UNIT I CONFIGURATION FOR LINEAR ICS

PART – A

1. **What is a primary advantage of using Integrated Circuits (ICs) over discrete components? (CO1,K1)**
   a) Higher cost
   b) Smaller size and higher reliability
   c) Limited frequency response
   d) Easier to repair
2. **Which of the following is NOT an advantage of Integrated Circuits (ICs)? (CO1,K1)**
   a) Miniaturization
   b) Reduced power consumption
   c) Higher cost of production
   d) Reduced number of interconnections
3. **ICs typically offer greater performance consistency over time and temperature due to: (CO1,K1)**
   a) External components
   b) Controlled manufacturing process
   c) Complex wiring
   d) Large size
4. **What is the main benefit of using ICs in digital circuits? (CO1,K1)**
   a) Faster switching speeds
   b) Complex analog behavior
   c) Large physical size
   d) Increased component count
5. **What is the first stage of an operational amplifier like IC 741? (CO1,K1)**
   a) Differential amplifier
   b) Buffer amplifier
   c) Voltage amplifier
   d) Output stage
6. **What is the primary purpose of the internal stage of an IC 741 operational amplifier? (CO1,K1)**
   a) To provide high output voltage
   b) To amplify the input signal
   c) To filter the signal
   d) To power external components

7. **Which internal component is commonly used to create the input differential amplifier in the IC 741 op-amp? (CO1,K1)**
    a) Transistors
    b) Resistors
    c) Capacitors
    d) Inductors
8. **In the IC 741, the output stage is designed to provide (CO1,K1)**
    a) High gain
    b) Low impedance
    c) Linear response
    d) Non-inverting output
9. **Which parameter indicates the low-frequency performance of an operational amplifier? (CO1,K1)**
    a) Slew rate
    b) Open-loop gain
    c) Bandwidth
    d) Input offset voltage
10. **The DC performance characteristic of an operational amplifier refers to: (CO1,K1)**
    a) Voltage gain at high frequencies
    b) Output swing and input offset voltage
    c) Slew rate and bandwidth
    d) Frequency response
11. **The typical DC offset voltage in an ideal operational amplifier is: (CO1,K1)**
    a) Zero
    b) Very low but non-zero
    c) High
    d) Infinite
12. **What does the AC performance of an operational amplifier primarily focus on? (CO1,K1)**
    a) Slew rate and bandwidth
    b) Input offset voltage
    c) Output swing
    d) Power supply rejection ratio
13. **The bandwidth of an operational amplifier is affected by: (CO1,K1)**
    a) The slew rate
    b) The open-loop gain
    c) The power supply voltage
    d) The output load
14. **The slew rate of an operational amplifier refers to: (CO1,K1)**
    a) The maximum rate of change of the output voltage with respect to time
    b) The time taken for the input voltage to reach its final value
    c) The maximum output current
    d) The speed of the input signal
15. **If an operational amplifier has a low slew rate, which of the following is most likely to occur? (CO1,K1)**
    a) Distortion at high frequencies
    b) Decreased output impedance
    c) Higher input offset voltage
    d) Improved power consumption
16. **In IC 741, the typical slew rate is: (CO1,K1)**
    a) 0.1 V/μs
    b) 1 V/μs
    c) 0.5 V/μs
    d) 10 V/μs

17. **In a closed-loop configuration, an operational amplifier's feedback: (CO1,K1)**
    a) Is applied to the input directly
    b) Enhances gain
    c) Reduces gain and stabilizes performance
    d) Has no impact on performance

18. **In a closed-loop configuration, the feedback factor typically: (CO1,K1)**
    a) Increases the gain significantly
    b) Reduces the gain to a predictable value
    c) Has no effect on the operational amplifier
    d) Reduces the bandwidth significantly
19. **The open-loop gain of an operational amplifier is typically: (CO1,K1)**
    a) Very low
    b) Moderate
    c) Extremely high
    d) Non-existent
20. **Which configuration is typically used to maintain a constant voltage gain in operational amplifier circuits? (CO1,K1)**
    a) Open-loop
    b) Closed-loop
    c) Open circuit
    d) Floating input

PART – B

1. What is an integrated circuit? (CO1, K1)
2. Classify ICs on the basis of fabrication, active devices used, isolation and type of FET. (CO1, K2)
3. What are the different linear IC packages? (CO1, K1)
4. What is an operational amplifier? (CO1, K1)
5. Draw the circuit symbol of operational amplifier. (CO1, K1)
6. Draw the pin diagram of 8 pin DIP IC741. (CO1, K1)
7. List the advantages of integrated circuits over discrete component circuit. (CO1, K1)
8. List the characteristics of an ideal operational amplifier. (CO1, K1)
9. Define slew rate. What causes the slew rate**?** (CO1, K1)
10. What is the need for frequency compensation in practical op-amps? (CO1, K1)
11. Design an amplifier with a gain of -10 and input resistance of 10kΩ. (CO1, K2)
12. What is virtual ground of operational amplifier? (CO1, K1)
13. List the DC and AC characteristics of operational amplifier. (CO1, K1)
14. Define input bias current. (CO1, K1)
15. Define input offset voltage of a differential amplifier. (CO1, K1)
16. Define input offset current. (CO1, K1)
17. Define thermal drift. (CO1, K1)
18. What are the two basic feedback connections in an operational amplifier? (CO1, K1)
19. Draw the circuit of inverting amplifier. (CO1, K1)
20. Draw the circuit of non-inverting amplifier. (CO1, K1)

PART – C

1. Illustrate the internal stages of IC741 operational amplifier. (7) (CO1, K2)
2. Draw the circuit diagram of IC741 operational amplifier and explain in detail. (CO1, K2)
3. Demonstrate inverting and non-inverting amplifier of ideal operational amplifier. (7) (CO1, K2)
4. Draw the inverting and non-inverting amplifier circuits of an op-amp in closed loop configuration. Infer the expressions for the closed loop gain in these circuits. (7) (CO1, K2)

5. Explain DC performance characteristics of operational amplifier. (CO1, K2)
6. Explain AC performance characteristics of operational amplifier. (CO1, K2)
7. Define slew rate. Explain the cause of slew rate and outline an expression for slew rate of voltage follower using operational amplifier? (CO1, K2)

UNIT II APPLICATIONS OF OPERATIONAL AMPLIFIERS

PART – A

1. Which of the following is true about a scale changer circuit? (CO2, K1)
A) It changes the amplitude of the input signal while keeping the frequency constant.
B) It changes the frequency of the input signal while keeping the amplitude constant.
C) It changes both amplitude and frequency of the input signal.
D) It only changes the voltage level of the input signal.

2. What is the main function of an adder and subtractor circuit? (CO2, K1)
A) To add or subtract voltage values in the input signals.
B) To convert a digital signal to analog.
C) To amplify the signal.
D) To limit the output signal to a specific range.

3. An instrumentation amplifier is primarily used to: (CO2, K1)
A) Amplify low-level differential signals.
B) Generate high-frequency signals.
C) Filter noise from signals.
D) Convert voltage to current.

4. In a phase shift circuit, the phase shift is typically controlled by: (CO2, K1)
A) The capacitance and resistance in the circuit.
B) The frequency of the input signal.
C) The number of active components used.
D) Both A and B.

5. The main purpose of a voltage follower (buffer amplifier) is: (CO2, K1)
A) To increase the gain of the input signal.
B) To decrease the input impedance.
C) To provide high input impedance and low output impedance.
D) To convert voltage to current.

6. A Voltage-to-Current (V-to-I) converter is used to: (CO2, K1)
A) Convert a voltage signal into a proportional current signal.
B) Convert a current signal into a proportional voltage signal.
C) Add two signals together.
D) Amplify the current in a signal.

7. An Current-to-Voltage (I-to-V) converter is used to: (CO2, K1)
A) Convert a current signal into a proportional voltage signal.
B) Convert a voltage signal into a proportional current signal.
C) Filter high-frequency signals.
D) Generate pulses in the output.

8.The primary purpose of a peak detector circuit is to: (CO2, K1)
A) Detect the highest peak value of an input signal.
B) Detect the average value of an input signal.
C) Filter out low-frequency components.
D) Amplify the input signal.

9. What does a clipper circuit do? (CO2, K1)
A) It clips off the higher voltage levels of the input signal.
B) It amplifies low-level signals.
C) It increases the frequency of the input signal.
D) It filters out unwanted noise in the signal.

10. What is the main function of a clamper circuit? (CO2, K1)
A) It adds a DC voltage to the input signal.
B) It clips off the higher voltage levels of the input signal.
C) It filters high-frequency noise from the signal.
D) It amplifies the signal.

11. A differentiator circuit produces an output that is: (CO2, K1)
A) Directly proportional to the derivative of the input signal.
B) The integral of the input signal.
C) Inverted with respect to the input signal.
D) The same as the input signal.

12. An integrator circuit produces an output that is: (CO2, K1)
A) The time integral of the input signal.
B) The derivative of the input signal.
C) Inverted with respect to the input signal.
D) Equal to the input signal.

13. What is the function of a comparator circuit? (CO2, K1)
A) It compares two input voltages and produces a high or low output based on which input is larger.
B) It amplifies the input signal.
C) It converts a voltage signal to a proportional current.
D) It filters the frequency of the input signal.

14. A Schmitt trigger is used to: (CO2, K1)
A) Convert noisy or analog signals into clean digital signals.
B) Convert a voltage signal into a proportional current.
C) Amplify low-level signals.
D) Integrate the input signal.

15. A low-pass filter allows: (CO2, K1)
A) Low-frequency signals to pass while attenuating high-frequency signals.
B) High-frequency signals to pass while attenuating low-frequency signals.
C) Both low and high-frequency signals to pass.
D) The signal to be amplified.

16. A high-pass filter allows: (CO2, K1)
A) High-frequency signals to pass while attenuating low-frequency signals.
B) Low-frequency signals to pass while attenuating high-frequency signals.
C) Both low and high-frequency signals to pass.
D) The signal to be amplified.

17. A band-pass filter allows: (CO2, K1)
A) A specific range of frequencies to pass while attenuating frequencies outside the range.
B) Only low frequencies to pass.
C) Only high frequencies to pass.
D) The signal to be amplified.

18.Which of the following is a key characteristic of an instrumentation amplifier? (CO2, K1)
A) High input impedance and low output impedance.
B) High output impedance.
C) Low input impedance.
D) Operates only with high-frequency signals.

19. In a phase shift circuit, the phase shift is directly related to: (CO2, K1)
A) The frequency of the input signal.
B) The amplitude of the input signal.
C) The temperature of the circuit.
D) The input impedance.

20. What is the voltage gain of a voltage follower circuit? (CO2, K1)
A) 1
B) 2
C) 10
D) Dependent on the input signal frequency

PART – B

1. Define Scale changer. (CO2, K1)
2. When inverting amplifier is called inverter? (CO2, K1)
3. What is an adder/summing amplifier? (CO2, K1)
4. What is an instrumentation amplifier? (CO2, K1)
5. List the features of an instrumentation amplifier. (CO2, K1)
6. What is the function of phase shift circuit? (CO2, K1)
7. Define voltage follower. (CO2, K1)
8. Draw the schematic of op-amp based voltage to current converter. (CO2, K1)
9. What is a function of current to voltage converter? (CO2, K1)
10. Draw the circuit diagram of differentiator and give its output equation. (CO2, K1)
11. Draw the circuit diagram of integrator and give its output equation. (CO2, K1)
12. State the errors in an ideal differentiator. (CO2, K1)
13. What are the disadvantages of integrator using operational amplifier? (CO2, K1)
14. Compare clipper with clamper circuits (CO2, K2)
15. Illustrate the circuit diagram of peak detector with waveforms. (CO2, K2)
16. Define comparator. (CO2, K1)
17. List the applications of comparator. (CO2, K1)
18. What is schmitt trigger? (CO2, K1)
19. Summarize advantages of active filters over passive filters. (CO2, K2)
20. Classify filters. (CO2, K2)

PART – C

1. Summarize two types of adder circuit. (7) **(**CO2, K2**)**
2. (i) Explain voltage-current converter with a neat diagram. (7) (CO2, K2)
   (ii) Explain current – voltage converter with a neat diagram. (7) (CO2, K2)
3. Outline the function of instrumentation amplifier and derive the expression for gain.(CO2, K2)
4. Develop the magnitude and phase response of phase lag and lead circuits. (CO2, K3)
5. Develop the following circuits (i) voltage follower (ii) subtractor. (CO2, K3)
6. (i) Design an differentiator to differentiate an input signal with maximum frequency of 100Hz. (CO2, K3)

(ii)Draw the output waveform for a sine wave of 1Vpeak at 100hz applied to the differentiator.(CO2,K3)

7. Make use of operational amplifier, explain the working principle of inverting and non inverting comparator. (CO2, K3)
8. Develop the operational amplifier based schmitt trigger circuit (CO2, K3)
9. Build the circuit of integrator and differentiator and derive an expression for output in terms of the input waveforms. (CO2, K3)
10. Design a clipper circuit for a clipping level of +0.61V, given an input sine wave signal of 0.5V peak. Assume the gain of the amplifier is 12 and it has an input resistance of 1kΩ connected. (7) (CO2, K3)
11. Develop the following circuits (i) Peak detector (ii) clamper. (CO2, K3)

UNIT III ANALOG MULTIPLIER ICs AND PLL

PART A

1. **What is the primary function of an analog multiplier IC? (CO3,K1)**

    a) To amplify signals
    b) To add signals
    c) To multiply two input signals
    d) To convert analog to digital signals

2. **Which of the following is a common application of an analog multiplier IC? (CO3,K1)**

    a) Signal filtering
    b) Frequency modulation
    c) Audio amplification
    d) Frequency mixing in communication systems

3. **Which of the following is NOT an application of analog multiplier ICs? (CO3,K1)**
    a) Audio signal processing
    b) Frequency modulation
    c) Frequency multiplication and division
    d) High-frequency signal attenuation

4. **Which multiplier IC is commonly used in analog applications? (CO3,K1)**
    a) LM358
    b) AD633
    c) 555 Timer
    d) IC 741
5. **In an analog multiplier IC, the output is a function of: (CO3,K1)**
    a) The difference of input signals
    b) The sum of the input signals
    c) The product of the input signals
    d) The ratio of input signals

6. **The primary purpose of a Phase-Locked Loop (PLL) is to: (CO3,K1)**
    a) Amplify signals
    b) Lock the phase of an output signal to a reference signal
    c) Filter noise in communication systems
    d) Generate high-frequency oscillations
7. **In a basic PLL, the phase detector compares the phase of: (CO3,K1)**
    a) The input signal with a reference signal
    b) The input signal with the output signal
    c) Two output signals
    d) The reference signal with the output signal
8. **Which of the following components is NOT typically part of a basic PLL? (CO3,K1)**
    a) Phase detector
    b) Voltage-controlled oscillator (VCO)
    c) High-pass filter
    d) Loop filter

9. **The output frequency of a PLL is determined by: (CO3,K1)**

a) The input signal frequency
b) The phase difference between input and output
c) The characteristics of the VCO and the loop filter
d) The gain of the phase detector

10. **Which type of signal is typically used as the reference signal in a PLL? (CO3,K1)**

a) Sine wave
b) Square wave
c) Pulse signal
d) Triangular wave

11. **In a PLL, the closed-loop transfer function describes the relationship between: (CO3,K1)**

a) The input signal and output signal
b) The VCO and the phase detector
c) The filter and the phase detector
d) The input and the loop filter

12. **In a closed-loop PLL system, the loop filter is responsible for: (CO3,K1)**
a) Generating the reference signal
b) Filtering the error signal and controlling the VCO
c) Detecting phase differences
d) Amplifying the input signal

13. **In a PLL, which condition results in the system achieving phase lock? (CO3,K1)**
a) The phase difference between the input and output is zero
b) The VCO frequency is equal to the reference signal frequency
c) The loop gain is high
d) The phase detector is bypassed

14. **Which of the following statements about the PLL's closed-loop operation is true? (CO3,K1)**

a) It uses open-loop control to achieve phase synchronization

b) The phase detector output is independent of the loop filter
c) The PLL adjusts the output frequency to match the reference frequency
d) The VCO runs at a fixed frequency regardless of input

15. **The time constant of the PLL's loop filter primarily affects: (CO3,K1)**

a) The response time of the PLL to changes in input frequency
b) The stability of the VCO
c) The phase detector's gain
d) The frequency range of the PLL

16. **The output frequency of a Voltage-Controlled Oscillator (VCO) depends on: (CO3,K1)**
a) The input voltage
b) The reference signal frequency
c) The loop filter characteristics
d) The phase detector's gain

17. **A typical application of a VCO in a PLL is to: (CO3,K1)**

a) Generate the reference signal
b) Control the frequency of the output signal
c) Compare the phase of the input signal
d) Filter the error signal

18. **Which of the following is a common type of VCO used in PLL circuits? (CO3,K1)**

a) RC oscillator
b) Ring oscillator
c) Crystal oscillator
d) LC oscillator

19. **The IC 565 PLL consists of which of the following basic components? (CO3,K1)**

a) Phase detector, VCO, and filter
b) Amplifier, oscillator, and modulator
c) Phase detector, loop filter, and modulator
d) VCO, buffer, and comparator

20. **The PLL IC 565 can be used for which of the following applications? (CO3,K1)**

a) Frequency synthesizing
b) Signal modulation
c) Frequency multiplication and division
d) All of the above

PART – B

1. What is an analog multiplier ICs? (CO3, K1)
2. List the applications of an analog multiplier ICs. (CO3, K1)
3. Draw the transfer characteristics of four quadrant multiplier. (CO3, K1)
4. Define frequency doubler. (CO3, K1)
5. Define voltage squarer.(CO3, K1)
6. Define voltage divider.(CO3, K1)
7. What is the operation of square rooter? (CO3, K1)
8. Define capture range of PLL. (CO3,K1)
9. Define lock in range of PLL. (CO3,K1)
10. What is pull in time? (CO3,K1)
11. Draw the basic functional block diagram of a PLL?(CO3, K1)
12. List the applications of PLL. (CO3, K1)
13. What is a frequency synthesizer?. (CO3, K1)
14. Compare lock-in-range and capture range of PLL.(CO3,K2)
15. Draw the pin diagram of IC566. (CO3,K1)
16. Outline the expression of voltage to frequency conversion factor in VCO. (CO3, K2)
17. Draw the pin diagram of IC565. (CO3,K1)
18. Draw the capture transient curve of PLL. (CO3,K1)
19. What is a frequency multiplier? (CO3,K1)
20. What is a frequency divider? (CO3,K1)

PART C

1. Illustrate the operation of analog multiplier ICs. (CO3, K2)
2. (i) Outline the operation of frequency doubler and voltage squarer using a multiplier IC. (CO3, K2)

(ii) Outline the operation of Phase angle detector and square rooter using a multiplier IC. (CO3, K2)

3. Summarize the operations of division and taking square root can be carried out using a multiplier IC. (CO3, K2)
4. Explain the operation of IC566 VCO with a neat functional diagram and derive an expression for free running frequency.(CO3, K2)
5. Explain the operation of the basic functional block of phase locked loop with a neat schematic diagram. (CO3, K2)
6. Interpret the process of capturing the lock and derive the expression for capture range and lock range. (CO3, K2)
7. Interpret PLL as frequency synthesizing and frequency multiplication and division? (CO3, K2)
8. Explain the operation of IC565 monolithic PLL with a neat functional diagram. (CO3, K2)

UNIT IV ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTERS

PART A

1. **What is the main function of a high-speed sample and hold circuit? (CO4,K1)**

   A) To amplify signals
   B) To maintain the voltage level of a signal for a short period of time
   C) To convert analog signals to digital signals
   D) To filter unwanted signals

1. **Which of the following components is most commonly used in the construction of a high-speed sample and hold circuit? (CO4,K1)**

   A) Operational amplifier
   B) Capacitor
   C) Diode
   D) Inductor

2. **In a high-speed sample and hold circuit, the sample process occurs when the switch is: (CO4,K1)**

   A) Open
   B) Closed
   C) Shorted
   D) Inactive

3. **Which of the following is a primary advantage of using a high-speed sample and hold circuit in A/D conversion? (CO4,K1)**

   A) Increased power consumption
   B) High accuracy in signal acquisition
   C) Reduced signal noise
   D) Faster data transmission

5. **Which of the following best describes the Flash A/D Converter? (CO4,K1)**

   A) It uses a series of comparators to quickly determine the analog input voltage.
   B) It performs analog to digital conversion sequentially.
   C) It uses an internal clock to determine conversion speed.
   D) It uses a capacitor to hold a voltage value during conversion.

6. **In a Flash A/D converter, how many comparators are required for an N-bit conversion? (CO4,K1)**

   A) 2^{N-1}
   B) 2(N-1)
   C) N
   D) 2^{N}

7. **The Flash A/D converter is most suitable for: (CO4,K1)**

    A) Low-speed applications
    B) High-speed, real-time applications
    C) Applications requiring high resolution
    D) Long-term data storage

8. **Which of the following is a disadvantage of Flash A/D converters? (CO4,K1)**

    A) High power consumption
    B) Slow conversion speed
    C) Low resolution
    D) High component count

9. **A Successive Approximation A/D converter works by: (CO4,K1)**

    A) Sequentially adjusting a reference voltage to match the input signal
    B) Using a series of comparators to quickly determine the value
    C) Converting an analog signal to a binary value in one step
    D) Holding the analog signal for a set period

10. **In a Successive Approximation A/D converter, which component is crucial for performing the approximation? (CO4,K1)**

    A) Sample and hold circuit
    B) Comparator
    C) Digital-to-analog converter (DAC)
    D) Voltage reference

11. **In a single-slope A/D converter, the analog signal is converted by: (CO4,K1)**

    A) Comparing the input voltage to a ramp voltage
    B) Using a parallel counter to determine the digital output
    C) Converting the signal using a resistor network
    D) A voltage comparator

12. **Which is a disadvantage of the Single Slope A/D converter?**

    A) High conversion speed
    B) High resolution
    C) Poor accuracy in fast-changing signals
    D) High complexity

13. **In a dual-slope A/D converter, the conversion process includes: (CO4,K1)**

    A) An integration phase and a de-integration phase
    B) A series of comparisons with a reference voltage
    C) A ramp signal generating a constant slope
    D) Using a feedback loop for approximation

14. **The advantage of a dual-slope A/D converter is: (CO4,K1)**

A) High-speed conversion
B) High resolution and noise rejection
C) Low power consumption
D) Simple circuitry

15. **In an A/D converter using voltage-to-time conversion, the voltage input is converted to: (CO4,K1)**

A) A proportional time interval
B) A direct binary value
C) A ramp voltage
D) A digital code

16. **Which of the following is a key benefit of voltage-to-time conversion A/D converters? (CO4,K1)**

A) Reduced complexity
B) High speed with low resolution
C) Better noise immunity
D) High resolution with slow conversion

17. **Which of the following is true for a D/A converter? (CO4,K1)**

A) It converts digital signals to analog signals.
B) It uses a time-varying voltage reference for conversion.
C) It requires more power than an A/D converter.
D) It uses a flash architecture for conversion.

18. **The main function of a D/A converter is to: (CO4,K1)**

A) Maintain a constant output voltage
B) Convert digital data into an analog voltage or current
C) Filter analog signals
D) Sample and hold an analog signal

19. **In a weighted resistor D/A converter, each resistor's value is related to: (CO4,K1)**

A) The binary weight of the corresponding bit
B) The analog signal voltage level
C) The temperature of the circuit
D) The power consumption of the circuit

20. **A disadvantage of the weighted resistor D/A converter is (CO4,K1)**

A) Complexity in design
B) Limited accuracy due to resistor matching
C) High power consumption
D) Poor linearity in output

PART – B

1. What is a sample and hold circuit? Where it is used? (CO4, K1)
2. What is the need for sample and hold circuit? (CO4, K1)
3. Define sampling rate. (CO4, K1)
4. Define Nyquest rate. (CO4, K1)
5. Which type ADC is the fastest? Why? (CO4, K1)
6. Define resolution of DAC. (CO4, K1)
7. List the applications of analog to digital converter. (CO4, K1)
8. List the applications of digital to analog converter. (CO4, K1)
9. Classify DAC on the basis of their output. (CO4, K2)
10. Classify ADC on the basis of their output. (CO4, K2)
11. Define monotonicity of a DAC. (CO4, K1)
12. Draw the block schematic of DAC and ADC. (CO4, K1)
13. Compare binary ladder and R-2R Ladder type DAC. (CO4, K2)
14. A 12-bit D/A converter has a resolution of 20mV/LSB. Find the full scale output voltage. What would be produced by a DAC, when output range is 0 to 10v and whose input binarynumber is 10111100(for 8 bit DAC)? (CO4, K2)
15. List the advantages of R-2Rladder type DAC when compared to weighted resistor type(CO4,K1)
16. Find the number of comparators and resistors required for 8bit flash type ADC? (CO4, K1)
17. A 12-bit D/A converter has a resolution of 20mV/LSB. Find the full scale output voltage. (CO4, K2)
18. Draw the binary ladder network of DAC. If the value of the smaller resistance is 10kΩ, what is the value of the other resistance?. (CO4, K1)
19. What are the demerits of weighed resistor digital to analog converter? (CO4, K1)
20. Write the names of switches used in MOS transistors. (CO4, K1)

PART C

1. Explain in detail on the operational features of weighed resistor type D/A converter. (CO4, K2)
2. Build the operational features of inverted R-2R ladder type D/A converter. (CO4, K3)
3. Build the operational features of R-2R ladder type D/A converter. (CO4, K3)
4. (i)Illustrate the operation of high speed sample and hold circuit.(7) (CO4, K2)
5. (ii) Illustrate the operation of voltage to time conversion circuit.(7) (CO4, K2)
6. Explain the operation of a flash (parallel) type ADC with circuit diagram. (CO4, K2)
7. Explain the operation of a successive approximation type ADC with neat internal diagram. (CO4, K2)
8. Draw the block diagram and explain single slope ADC. (CO4, K2)
9. Explain the operation of dual slope type analog to digital converters. (CO4, K2)
10. Summarize the important specifications of D/A and A/D converters. (CO4, K2)

UNIT V WAVEFORM GENERATORS AND SPECIAL FUNCTION ICS

1. **Which of the following is a common application of sine-wave generators? (CO5,K1)**

    A) Audio signal generation
    B) Digital signal processing
    C) Image display
    D) Power supply regulation

2. **The frequency of a triangular wave generator can be controlled by adjusting the: (CO5,K1)**

    A) Input voltage
    B) Resistance in the feedback loop
    C) Capacitor value
    D) Both B and C

3. **A saw-tooth wave generator produces: (CO5,K1)**

    A) A waveform with equal positive and negative slopes
    B) A waveform with a linear rising edge and a steep falling edge
    C) A waveform with constant amplitude
    D) A waveform with only a single slope

4. **Which of the following is used to create a square wave with a specified frequency? (CO5,K1)**

    A) Triangular wave generator
    B) Oscillator
    C) Saw-tooth wave generator
    D) Frequency divider

5. **In which application is a triangular wave generator commonly used? (CO5,K1)**

    A) Audio synthesis
    B) Pulse width modulation (PWM)
    C) Signal modulation
    D) Both B and C

6. **The ICL8038 IC is primarily used as a: (CO6,K1)**

    A) Function generator
    B) Power amplifier
    C) Voltage regulator
    D) Timer IC

7. **The ICL8038 function generator can produce: (CO6,K1)**

    A) Sine, square, and triangular waves
    B) Only square waves
    C) Only sine waves
    D) Only triangular waves

8. **Which parameter of the ICL8038 is typically adjusted to change the frequency of the waveform? (CO6,K1)**

    A) Capacitor
    B) Resistor
    C) Voltage
    D) Both A and B

    Answer: D) Both A and B

9. **The ICL8038 is often used in applications requiring: (CO6,K1)**

    A) Low-frequency sine waves
    B) High-frequency square waves
    C) Precision timing
    D) Both A and C

10. **The 555 timer IC is commonly used in: (CO6,K1)**

    A) Monostable circuits
    B) Astable circuits
    C) Frequency generation
    D) All of the above

11. **The 555 timer IC can be configured as: (CO6,K1)**

    A) Monostable multivibrator
    B) Astable multivibrator
    C) Both A and B
    D) Only monostable multivibrator

12. **Which of the following is a characteristic of the monostable operation of the 555 timer? (CO6,K1)**

    A) Produces a continuous waveform
    B) Produces a single output pulse in response to a trigger
    C) Requires a constant input signal
    D) None of the above

13. **In astable mode, the 555 timer behaves like: (CO6,K1)**

    A) A flip-flop oscillator
    B) A one-shot timer
    C) A voltage regulator

D) A voltage comparator

14. **The output frequency of a 555 timer in astable mode is determined by: (CO6,K1)**

A) The trigger voltage
B) The capacitor and resistors
C) The input pulse width
D) The supply voltage

15. **In monostable mode, the 555 timer's output stays high for: (CO6,K1)**

A) A fixed time period, then returns to low
B) A fixed time period, then switches to high again
C) Until the trigger is reset
D) As long as the input remains high

16. **In astable mode, the 555 timer's output is: (CO6,K1)**

A) A continuous pulse train
B) A single pulse
C) Constant high
D) Constant low

17. **The LM317 is commonly used as: (CO6,K1)**

A) A fixed voltage regulator
B) An adjustable voltage regulator
C) A voltage comparator
D) A power amplifier

18. **The LM317 requires which of the following components for voltage adjustment? (CO6,K1)**

A) A potentiometer
B) A capacitor
C) A diode
D) A resistor

19. **Which of the following is the correct voltage range for an LM317 adjustable voltage regulator? (CO6,K1)**

A) 1.25V to 40V
B) 1.25V to 15V
C) 3.3V to 5V
D) 5V to 25V

20. **What is the main purpose of using a feedback resistor in the LM317 voltage regulation circuit? (CO6,K1)**

A) To reduce power loss
B) To adjust the output voltage
C) To improve load regulation
D) To provide stability to the circuit

PART – B

1. List the two condition for oscillations**.** (CO5,K1)
2. What is monostable multivibrator circuit? (CO5,K1)
3. What is astable multivibrator circuit? (CO5,K1)
4. List the applications of monostable multivibrator. (CO5,K1)
5. List the applications of astable multivibrator. (CO5,K1)
6. Draw the monostable multivibrator using op-amp. (CO5,K1)
7. Draw the astable multivibrator using op-amp. (CO5,K1)
8. Name some oscillator circuits. (CO5,K1)
9. Draw the pin diagram of IC 555 timer. (CO6,K1)
10. Draw the monostable multivibrator using IC555. (CO6,K1)
11. Draw the astable multivibrator using IC555. (CO6,K1)
12. What is the function of a voltage regulator? (CO6,K1)
13. List the various voltage regulator characteristics. (CO6,K1)
14. Name few IC voltage regulators? (CO6,K1)
15. Draw the functional block diagram of LM317 voltage regulator. (CO6,K1)
16. Define duty cycle in astable multivibrator using IC 555. (CO6,K1)
17. Draw the circuit diagram of triangular waveform generator.
18. Define Line regulation. (CO6,K1)
19. Define Load regulation. (CO6,K1)
20. List the limitations of voltage regulator. (CO6,K1)

PART C

1. Explain the working principle of a sine wave generator using operational amplifier.(CO5,K2)
2. Explain the working principle and salient features of a triangular wave generator and saw tooth wave generator. .(CO5,K2)
3. Explain the operation of an astable multivibrator using operational amplifier with necessary diagrams.(CO5,K2)
4. Explain the operation monostable multivibrator using operational amplifier with necessary diagrams. (CO5,K2)
5. Construct the operation of an astable multivibrator using timer IC555 with necessary diagrams. .(CO6,K3)
6. Make use of IC555 time, explain the operation of an momostable multivibrator with necessary diagrams .(CO6,K3)
7. Build the operation of LM317 voltage regulator with neat diagram. .(CO6,K3)