

Unit-1

Who first used the term "Operational Amplifier" in 1947?

- a) Robert Noyce
- b) Jack Kilby
- c) John R. Ragazzini**
- d) Gordon Moore

What is one of the primary functions of an Op Amp?

- a) Frequency modulation
- b) Phase shifting
- c) Amplification**
- d) Digital to analog conversion

Which of the following operations can an Op Amp perform?

- a) Multiplication
- b) Addition**
- c) Division
- d) Sorting

What type of amplifier stages are interconnected in an Op Amp?

- a) Single stage amplifiers
- b) Differential amplifier stages**
- c) Common base amplifiers
- d) Current amplifiers

What devices are used in the internal differential amplifiers of an Op Amp?

- a) Diodes
- b) Transformers
- c) BJTs or FETs**
- d) Inductors

What is the typical configuration of a differential amplifier in an Op Amp using BJTs?

- a) Common collector
- b) Common base
- c) Common emitter**
- d) Common drain

Which company introduced the first Op Amp, the μ A741?

- a) Intel
- b) Texas Instruments
- c) Fairchild Semiconductor**
- d) Analog Devices

An operational amplifier can amplify which types of signals?

- a) Only AC signals
- b) Only DC signals
- c) Both AC and DC signals**
- d) Only digital signals

What is the function of the input stage in an Op Amp?

- a) Provide high output impedance
- b) Amplify the difference between two input signals**
- c) Shift the DC level
- d) Act as a voltage follower

Why is an intermediate stage used in an Op Amp?

- a) To reduce noise
- b) To increase input impedance
- c) To provide additional voltage gain**
- d) To filter the input signal

What is the purpose of the buffer and level shifting stage in an Op Amp?

- a) Increase gain
- b) Match impedance
- c) Shift the DC level to ground potential**
- d) Reduce output impedance

What configuration is typically used in the output stage of an Op Amp?

- a) Common base
- b) Push pull complementary**
- c) Common collector
- d) Common source

In single ended input operation of an Op Amp, what is the configuration?

- a) Both inputs are connected to the same signal
- b) One input is grounded, and the signal is applied to the other**
- c) No inputs are connected
- d) Inputs are connected in parallel

How many op-amps will require to implement this equation $V_o = V_1$

- a) 1**
- b) 4
- c) 5
- d) 6

The input stage in block diagram of operational amplifier is-

- a) Single input Balanced output
- b) Dual input Unbalanced output
- c) Single input Unbalanced output
- d) Dual input Balanced output**

What happens in common mode operation of an Op Amp?

- a) Both inputs are grounded

b) Different signals are applied to each input

c) The same input signals are applied to both inputs

d) No signal is applied

The circuit used after the intermediate stage in block diagram of an op-amp to shift the dc level at the output of the intermediate stage downward to zero volts with respect to ground is called as-

a) The Level detector circuit

b) The level shifter circuit

c) Level sensor circuit

d) DC to AC convertor circuit

In an ideal Op Amp, what is the output voltage in common mode operation when $V_1 = V_2$?

a) $V_{out} = V_1$

b) $V_{out} = V_2$

c) $V_{out} = 0$

d) $V_{out} = V_1 + V_2$

In the differential voltage gain & the common mode voltage gain of a differential amplifier are 48db & 2db respectively, then its common mode rejection ratio is-

a) 23

b) 25

c) 46

d) 50

Practically, why does an Op Amp produce some output voltage in common mode operation even if $V_1 = V_2$?

a) Due to ideal conditions

b) Due to internal circuitry mismatches and noise

c) Due to high gain

d) Due to low input impedance

Opamp amplifies the difference between the two input signals, this configuration is called as-

a) Differential gain

b) Differential amplifier

- c) Filter
- d) Differentiator

The-----characteristic curve of an opamp is the graph of output voltage versus differential input voltage.

- a) **voltage transfer**
- b) voltage current
- c) differential voltage
- d) unity voltage

What is the main advantage of using an Op Amp in electronic circuits?

- a) Low cost
- b) Small size
- c) High reliability

d) All of the above

What type of **feedback** **is typically used to control the gain of an Op Amp?**

- a) Positive feedback

b) Negative feedback

- c) No feedback
- d) Direct feedback

The op-amp's output is generally either positive or negative saturation or switches between positive or negative saturation levels when op amp operated in-

- a) Closed loop
- b) Open loop**
- c)Both Closed loop and Open loop
- d) Neither open loop nor closed loop

What **is the role of the emitter follower in the buffer stage of an Op Amp?**

- a) Increase gain
- b) **Provide impedance matching**

- c) Shift DC level
- d) Act as a current source

The ideal OP-AMP has the following characteristics-

- a) $R_i = \infty$, $A = \infty$, $R_o = 0$
- b) $R_i = 0$, $A = \infty$, $R_o = 0$
- c) $R_i = \infty$, $A = \infty$, $R_o = \infty$
- d) $R_i = 0$, $A = \infty$, $R_o = \infty$

Which parameter is NOT significantly affected by the differential amplifier in the input stage of an Op Amp?

- a) High differential gain
- b) High input impedance
- c) Low output impedance
- d) Frequency response

Unit-2

What is the gain of an inverting amplifier?

- a) Zero
- b) Greater than one
- c) Less than one
- d) Negative

What is the main purpose of a voltage follower circuit?

- a) To amplify voltage
- b) To invert voltage
- c) To buffer voltage
- d) To scale voltage

Which of the following is a characteristic of a voltage follower?

- a) High input impedance

b) Low output impedance

c) High gain

d) Inverting input

What is the output voltage of a non-inverting amplifier?

a) Same as input voltage

b) Inverted input voltage

c) Half of input voltage

d) Double of input voltage

What is the main purpose of a difference amplifier?

a) To amplify the difference between two input voltages

b) To amplify the sum of two input voltages

c) To generate a constant voltage difference

d) To invert the difference between two input voltages

What is the effect of errors in an ideal integrator?

a) Decreased output impedance

b) Increased output voltage

c) Output drift over time

d) No effect on output

Which parameter affects the frequency response of a practical integrator?

a) Input impedance

b) Output impedance

c) Capacitor value

d) Resistor value

What is the output of an ideal differentiator for a constant input signal?

a) Zero

b) Constant

c) Ramp

d) Impulse

What causes errors in an ideal differentiator?

a) Capacitor leakage

b) Op-amp saturation

c) Resistor tolerance

d) Input voltage fluctuations

Which of the following is a characteristic of a practical differentiator?

a) High output impedance

b) Low input impedance

c) Accurate differentiation of high-frequency signals

d) No output voltage offset

The inverting amplifier amplifies the input signal by gain A and output voltage is out of phase with respect to input by 180°. Which one of the following equations is the best representation of this statement?

a) $V_o = A V_{in}$

b) $V_o = -A V_{in}$

c) $V_o = -A / V_{in}$

d) $V_o = -V_{in}/A$

A certain noninverting amplifier has R_i of $1\text{K}\Omega$ and R_f of $100\text{K}\Omega$, The closed-loop voltage gain is-

a) 101

b) 100

c) 100000

d) 1000

The circuit obtained by using a basic inverting amplifier configuration in which feedback resistor R_f is replaced by capacitor C_f is called as -

a) Integrator

b) Inverting Amplifier

c) Differentiator

d) Difference Amplifier

Additional feedback resistor R_f along with feedback capacitor C_f in integrator circuit reduces the problem of-

- a) High frequency roll off
- b) Stability and High frequency roll off
- c) Noise and Clipping

d) Unstability and low frequency roll off

What is the frequency response of an ideal integrator?

- a) Flat
- b) High-pass
- c) Low-pass**
- d) Band-pass

Which parameter primarily affects the frequency response of a practical differentiator?

- a) Resistor value
- b) Capacitor value**
- c) Op-amp gain
- d) Input voltage amplitude

When a step-input is given to an OP-amp integrator, the output will be

- a) A ramp**
- b) sinusoidal wave
- c) A rectangular wave
- d) A triangular wave with dc bias

-----is used as a rate-of-change detector in FM modulators.

- a) Integrator
- b) Voltage Follower
- c) Differentiator**
- d) Summing Amplifier

What is the output voltage of a voltage scaling circuit?

a) Same as input voltage

b) Proportional to input voltage

c) Inverted input voltage

d) Double of input voltage

What type of amplifier is a voltage follower?

a) Inverting

b) Non-inverting

c) Differential

d) Unity-gain

What happens to the output of a practical integrator at high frequencies?

a) Output increases

b) Output decreases

c) Output remains constant

d) Output oscillates

A voltage follower _____

a) has a voltage gain of 1

b) is noninverting

c) has no feedback resistor

d) has all of these

Which component primarily introduces errors in an ideal integrator?

a) Capacitor

b) Op-amp

c) Resistor

d) Power supply

What is the primary function of a voltage scaling circuit?

a) To amplify voltage

b) To convert voltage to current

c) To adjust the amplitude of a voltage signal

d) To filter out noise from a voltage signal

What is the output voltage of a difference amplifier if both input voltages are equal?

a) Zero

b) Double of input voltage

c) Same as input voltage

d) Inverted input voltage

What is the primary limitation of an ideal integrator?

a) Limited bandwidth

b) Input offset voltage

c) Output impedance

d) Drift over time

Unit-3

What is the primary function of a comparator in non-linear applications of operational amplifiers?

A) Amplify input signals

B) Generate sine waves

C) Compare input voltages

D) Filter noise

Which type of feedback is commonly used in a comparator circuit to provide hysteresis?

A) Positive feedback

B) Negative feedback

C) Unity feedback

D) Differential feedback

Which of the following circuit used as a comparator

A) Astable multivibrator

B) Bistable multivibrator

C) Monostable multivibrator

D) Schmitt Trigger

In a Schmitt trigger circuit, what is the purpose of providing hysteresis?

- A) To increase noise
- B) To decrease noise

C) To stabilize the output

- D) To amplify the input signal

Precision full-wave rectifier is often referred to as-

A) Absolute magnitude circuit

- B) Zero crossing detector
- C) Clipper Circuit
- D) Voltage Follower circuit

What happens when the input voltage of a Schmitt trigger crosses the upper threshold in the positive direction?

A) Output switches to high

- B) Output switches to low
- C) Output remains unchanged
- D) Output becomes undefined

Which component determines the frequency of oscillation in a square wave generator using an op-amp?

- A) Capacitor

B) Resistor

- C) Inductor
- D) Diode

A Schmitt trigger circuit achieves hysteresis by utilizing -

- A) Avalanche multiplication by zener diode
- B) The Barkhausen Principle

C) Regenerative positive feedback

- D) Magnetic property of a transformer core

In a triangular wave generator circuit, what determines the slope of the generated waveform?

- A) Capacitor charging time
- B) Resistor values**
- C) Feedback network
- D) Op-amp gain

What is a common problem encountered in basic rectifier circuits?

- A) High output voltage
- B) Low output current
- C) Reverse polarity

D) Ripple voltage

How a triangular wave generator is derived from square wave generator?

- A) Connect oscillator at the output
- B) Connect integrator at the output**
- C) Connect Voltage follower at the output
- D) Connect differential at the output

What is the primary function of a precision rectifier in non-linear applications?

- A) Increase ripple voltage
- B) Decrease output voltage
- C) Improve linearity of rectification**
- D) Amplify input signals

In a Schmitt trigger circuit, what is the purpose of providing hysteresis?

- A) To stabilize the output**
- B) To increase noise
- C) To decrease noise
- D) To amplify the input signal

Which type of rectifier circuit is most suitable for applications requiring high precision in rectification?

- A) Half-wave rectifier

B) Full-wave rectifier

C) Precision rectifier

D) Bridge rectifier

Which component in a full-wave precision rectifier circuit ensures that both positive and negative halves of the input signals are rectified?

A) Inductor

B) Capacitor

C) Resistor

D) Diode

What is the key advantage of a precision rectifier over a basic rectifier circuit?

A) Lower cost

B) Higher efficiency

C) Reduced distortion

D) Increased output current

In a precision rectifier we use an -----to compensate for the voltage drop across the diode, that is why we are not losing the 0.6V or 0.7V voltage drop across the diode.

A) op-amp

B) transistor

C) resistor

D) capacitor

In a half-wave precision rectifier circuit, what is the purpose of the diode in the feedback path?

A) To provide hysteresis

B) To block reverse voltage

C) To regulate output voltage

D) To eliminate diode drop

----- outputs are generated when opamp is forced to operate in saturation region.

A) Square wave

B) Sine wave

C) Noise

D) Cos wave

Which component in a full-wave precision rectifier circuit ensures that both positive and negative halves of the input signals are rectified?

A) Diode

B) Op-amp

C) Capacitor

D) Resistor

What is the function of the capacitor in a precision rectifier circuit?

A) Provide feedback

B) Smooth the output

C) Amplify the input

D) Control the gain

In a precision rectifier, what happens to the negative half-cycle of the input signal?

A) It is attenuated

B) It is amplified

C) It is inverted

D) It is rectified

What problem does a precision rectifier solve in comparison to a basic diode rectifier?

A) High output voltage

B) Low output current

C) Reverse polarity

D) Voltage drop across the diode

In a full-wave precision rectifier, what is the purpose of the op-amp in the feedback loop?

A) Provide gain

B) Control frequency

C) Amplify noise

D) Ensure correct polarity

What is the primary reason for using precision rectifiers in signal processing applications?

A) Reduce distortion

B) Increase ripple voltage

C) Improve efficiency

D) Enhance input impedance

Which type of precision rectifier is commonly used in applications where both positive and negative inputs need to be rectified?

A) Half-wave precision rectifier

B) Full-wave precision rectifier

C) Schmitt trigger

D) Comparator

What role does the op-amp play in the operation of a precision rectifier?

A) Provides feedback

B) Regulates voltage

C) Ensures linearity

D) Amplifies signals

What is the significance of the output of a comparator in non-linear applications of operational amplifiers?

A) Indicates input voltage level

B) Controls gain

C) Determines frequency

D) Drives external circuits

Unit-4

What type of filter response does a Butterworth filter exhibit?

A) Linear phase

B) Non-linear phase

C) Constant group delay

D) Variable group delay

Which order Butterworth filter provides the steepest roll-off in the stopband?

A) First order

B) Second order

C) Third order

D) Fourth order

What is the defining characteristic of a Butterworth filter's frequency response?

A) Ripple in the passband

B) Flat passband

C) Sharp transition band

D) Elliptic stopband

In the frequency response graph of an amplifier the 3 dB point refers to

A) zero power point

B) half power point

C) three fourth power point

D) quarter power point

In a Butterworth filter, how does increasing the order affect the roll-off rate?

A) Roll-off rate decreases

B) Roll-off rate increases

C) Roll-off rate remains constant

D) Roll-off rate becomes unpredictable

Ideal filter is the one which gives

A) zero attenuation in passband

B) infinite attenuation in passband

C) blocks all frequencies

D) high gain in stop band

What is the primary advantage of using an active filter over a passive filter?

- A) Lower cost
- B) Greater simplicity
- C) Higher selectivity

D) Reduced component count

How is the Q factor related to the bandwidth in a second-order filter?

- A) Q factor is inversely proportional to bandwidth
- B) Q factor is directly proportional to bandwidth**
- C) Q factor is independent of bandwidth
- D) Q factor determines the filter order

Filter is a-

- A) amplitude selective circuit
- B) frequency selective circuit**
- C) amplitude Clamping circuit
- D) amplitude damping circuit

Which type of filter is characterized by a flat passband and a sharp transition to the stopband?

- A) Butterworth**
- B) Chebyshev
- C) Bessel
- D) Elliptic

A _____ filter significantly attenuates all frequencies below f_c and passes all frequencies above f_c .

- A) Notch
- B) Low pass
- C) High pass**
- D) Band pass

What does the term "wideband" typically indicate in the context of filter design?

- A) Narrow transition band
- B) Wide stopband

C) Wide passband

D) High order

Filters with the _____ characteristic provide a very flat amplitude in the passband and a roll-off rate of -20 dB/decade/pole.

A) Notch

B) Bessel

C) Chebyshev

D) Butterworth

Which type of filter is commonly used to eliminate a specific narrow frequency range while preserving the rest of the spectrum?

A) Low-pass filter

B) High-pass filter

C) Band-stop filter

D) Band-pass filter

In a notch filter, what is the frequency at which maximum attenuation occurs?

A) Passband frequency

B) Stopband frequency

C) Center frequency

D) Cutoff frequency

A low-pass filter has a cutoff frequency of 1.50 kHz. Determine the bandwidth of the filter.

A) 6 kHz

B) 3 kHz

C) 1.50 kHz

D) 750 Hz

What characteristic defines an all-pass filter?

A) Passes all frequencies equally

B) Attenuates all frequencies equally

C) Shifts the phase of all frequencies equally

D) Inverts the phase of all frequencies equally

A _____ filter passes all frequencies within a band between a lower and an upper critical frequency and rejects all others outside this band.

A) band pass

B) low pass

C) high pass

D) notch

How does increasing the order of a Bessel filter affect its group delay?

A) Group delay decreases

B) Group delay increases

C) Group delay remains constant

D) Group delay becomes erratic

Which type of filter is best suited for applications where maintaining a constant group delay is crucial?

A) Butterworth

B) Chebyshev

C) Bessel

D) Elliptic

What parameter is typically used to adjust the center frequency of a band-pass filter?

A) Resistor value

B) Capacitor value

C) Inductor value

D) Tuning voltage

In an active filter, what component is **used** to provide amplification and compensate for signal losses?

A) Capacitor

B) Inductor

C) Operational amplifier

D) Resistor

What feature distinguishes a high-pass filter from a low-pass filter?

- A) Attenuates frequencies above the cutoff frequency
- B) Attenuates frequencies below the cutoff frequency**
- C) Passes frequencies above the cutoff frequency
- D) Passes frequencies below the cutoff frequency

Which filter type exhibits a passband that extends from DC to a specific cutoff frequency?

- A) Low-pass filter**
- B) High-pass filter
- C) Band-stop filter
- D) Band-pass filter

What is the primary advantage of a narrowband band-reject filter?

- A) High selectivity**
- B) Wide bandwidth
- C) Low passband ripple
- D) Simple design

What parameter does the bandwidth of a band-pass filter depend on?

- A) Q factor**
- B) Center frequency
- C) Gain
- D) Resonant frequency

How does the gain of an active filter typically vary with frequency?

- A) It remains constant**
- B) It decreases with increasing frequency
- C) It increases with increasing frequency
- D) It follows a specific function determined by the filter design

Unit 5

What is the primary function of a 555 Timer IC?

- A) Voltage regulation
- B) Signal amplification
- C) Timing and oscillator control**
- D) Digital logic processing

An astable 555 timer has the following number of stable states:

- A) Infinite
- B) 0**
- C) 1
- D) 2

Which of the following components is integrated within a 555 Timer IC?

- A) Transistor
- B) Capacitor
- C) Comparator**
- D) Diode

In the internal schematic of a 555 Timer IC, what is the purpose of the voltage divider?

- A) To provide reference voltage**
- B) To generate a clock signal
- C) To control output frequency
- D) To regulate power supply voltage

For trigger voltage less than $\frac{1}{3} V_{cc}$, the output of IC 555 is

- A) -1
- B) High**
- C) Infinite
- D) Zero

What is the function of the discharge transistor in a 555 Timer IC?

- A) To discharge the capacitor**
- B) To amplify the output signal
- C) To trigger the comparator
- D) To generate a clock pulse

Which mode of operation describes the 555 Timer IC functioning as a stable multivibrator with a continuous square wave output?

- A) Astable**
- B) Monostable
- C) Bistable
- D) Tristable

A multivibrator is a circuit which generates

- A) sine wave
- B) square wave**
- C) triangular wave
- D) cos wave

In the astable mode of operation, what determines the frequency of the output waveform?

- A) Capacitor charging time
- B) Resistance of the timing components**
- C) Voltage applied to the control pin
- D) Comparator threshold voltage

Astable multivibrator is a

- A) square wave clock.**
- B) flip-flop
- C) Filter
- D) Rectifier

What happens to the output of a 555 Timer IC configured in monostable mode after triggering?

- A) It remains high indefinitely

- B) It remains low indefinitely
- C) It oscillates between high and low states
- D) It returns to its original state after a fixed time**

Which component of a 555 Timer IC controls the duration of the output pulse in monostable mode?

- A) Capacitor**
- B) Comparator
- C) Transistor
- D) External trigger input

Monostable multivibrator has which of the following state(s)-

- I. One stable state
- II. One quasi-stable state

A) Neither I nor II

B) Both I and II

C) Only II

D) Only I

Which application of a 555 Timer IC involves generating precise time delays in electronic circuits?

- A) LED blinking circuits
- B) Tone generation in audio circuits
- C) Motor speed control
- D) Timing circuits for security systems**

In what range can the operating frequency of a 555 Timer IC typically be varied?

- A) From nanoseconds to microseconds
- B) From microseconds to milliseconds**
- C) From milliseconds to seconds
- D) From seconds to minutes

The pulse generating circuit in which the duration of pulse is determined by the RC network connected externally to the 555 timer is known as -

A) A Monostable multivibrator

B) Phase detector

C) Voltage controlled oscillator

D) Precision Rectifier

What happens to the output frequency of a 555 Timer IC in astable mode when the resistance of the timing components is increased?

A) Frequency increases

B) Frequency decreases

C) Frequency remains constant

D) Frequency becomes unstable

When not in use which pin of IC 555 should be bypassed to ground with 0.01 micro farad capacitor to prevent any noise problem?

A) Pin no 2- Trigger

B) Pin no 5-Control voltage

C) Pin no 6- Threshold

D) Pin no 7- Discharge

Which parameter of a 555 **Timer** IC primarily determines the duty cycle of the output waveform in astable mode?

A) Capacitor value

B) Threshold voltage

C) Control voltage

D) Ratio of charging and discharging resistances

Which of the following is NOT a characteristic of the 555 Timer IC in monostable mode?

A) It produces a single output pulse

B) Output pulse duration is determined by external components

C) It continuously generates a square wave output

D) It requires an external trigger to initiate the pulse

Which of the following first introduced 555 as the SE/NE 555 in early 1970?

- A) National Semiconductor
- B) Fairchild corporation
- C) Signetics corporation**
- D) Texas Instruments

What is the primary function of the control voltage pin (5) on a 555 Timer IC?

- A) To set the reference voltage for the internal comparators
- B) To adjust the output frequency in astable mode**
- C) To trigger the internal flip flop
- D) To regulate the power supply voltage

Which external component is crucial for controlling the output frequency in astable mode?

- A) Capacitor
- B) Resistor**
- C) Diode
- D) Transistor

What effect does decreasing the value of the timing resistor have on the output frequency of a 555 Timer IC in astable mode?

- A) Frequency increases**
- B) Frequency decreases
- C) Duty cycle decreases
- D) Duty cycle increases

Which of the following is a typical application of a 555 Timer IC in monostable mode?

- A) Electronic doorbell**
- B) Rectifier
- C) Temperature sensor
- D) Voltage regulator

What happens to the output of a 555 Timer IC in astable mode when the timing capacitor is increased?

A) Frequency decreases

B) Frequency increases

C) Duty cycle decreases

D) Duty cycle increases

Which of the following is NOT a common application of the 555 Timer IC?

A) Pulse width modulation (PWM)

B) Frequency modulation (FM)

C) Pulse position modulation (PPM)

D) Tone generation

In monostable mode, what determines the duration of the output pulse?

A) External trigger width

B) Voltage applied to the control pin

C) Resistance of the timing resistor

D) Capacitor charging time
