Basic Concepts of BJTs

1. **What does BJT stand for?**
   a) Bipolar Junction Transistor
   b) Binary Junction Transistor
   c) Base Junction Transformer
   d) Bipolar Joint Transformer
   Answer: a) Bipolar Junction Transistor
2. **Which are the three terminals of a BJT?**
   a) Base, Collector, Capacitor
   b) Base, Collector, Emitter
   c) Emitter, Source, Drain
   d) Anode, Cathode, Gate
   Answer: b) Base, Collector, Emitter
3. **What are the two types of BJTs?**
   a) NPN and PNP
   b) NMOS and PMOS
   c) Enhancement and Depletion
   d) Anode and Cathode
   Answer: a) NPN and PNP
4. **What type of carriers are dominant in NPN BJTs?**
   a) Holes
   b) Electrons
   c) Both Holes and Electrons equally
   d) None of the above
   Answer: b) Electrons
5. **Which region of the BJT is lightly doped?**
   a) Base
   b) Emitter
   c) Collector
   d) All regions are equally doped
   Answer: a) Base

Working Principle

6. **In the active region, the emitter-base junction is ____ biased, and the collector-base junction is ____ biased.**
   a) Reverse, Forward
   b) Forward, Forward
   c) Forward, Reverse
   d) Reverse, Reverse
   Answer: c) Forward, Reverse
7. **What happens to the current in the base region of a BJT?**
   a) It is negligible

b) It is equal to the emitter current
c) It is equal to the collector current
d) It is higher than the emitter current
Answer: a) It is negligible

8. **Which of the following is true for a BJT in saturation?**
   a) VCE is high
   b) VCE is low
   c) VBE is reverse biased
   d) Both junctions are reverse biased
   Answer: b) VCE is low
9. **In which region does a BJT act as an amplifier?**
   a) Cut-off region
   b) Active region
   c) Saturation region
   d) Breakdown region
   Answer: b) Active region
10. **What is the typical voltage drop across the base-emitter junction in a silicon BJT?**
    a) 0.3 V
    b) 0.7 V
    c) 1.2 V
    d) 1.5 V
    Answer: b) 0.7 V

Configurations

11. **In which configuration is the input impedance the lowest?**
    a) Common Emitter
    b) Common Base
    c) Common Collector
    d) None of the above
    Answer: b) Common Base
12. **Which configuration provides the highest voltage gain?**
    a) Common Base
    b) Common Emitter
    c) Common Collector
    d) None of the above
    Answer: b) Common Emitter
13. **Which BJT configuration is primarily used as a buffer?**
    a) Common Emitter
    b) Common Base
    c) Common Collector
    d) None of the above
    Answer: c) Common Collector

14. **What is the phase relationship between input and output in a common-emitter configuration?**
    a) 0°
    b) 90°
    c) 180°
    d) 270°
    Answer: c) 180°
15. **Which configuration has the highest current gain?**
    a) Common Base
    b) Common Emitter
    c) Common Collector
    d) None of the above
    Answer: c) Common Collector

Biasing and Stability

16. **What is the purpose of biasing in BJTs?**
    a) To amplify signals
    b) To stabilize operating point
    c) To reduce current flow
    d) None of the above
    Answer: b) To stabilize operating point
17. **Which biasing method provides the most stable operating point?**
    a) Fixed bias
    b) Collector-to-base bias
    c) Voltage-divider bias
    d) Emitter feedback bias
    Answer: c) Voltage-divider bias
18. **Which component is typically added in biasing circuits to improve thermal stability?**
    a) Capacitor
    b) Resistor
    c) Diode
    d) Inductor
    Answer: b) Resistor
19. **What happens to the operating point if temperature increases in a fixed bias circuit?**
    a) Remains stable
    b) Shifts toward cut-off
    c) Shifts toward saturation
    d) None of the above
    Answer: c) Shifts toward saturation
20. **The stability factor measures the sensitivity of ____ to temperature changes.**
    a) Base current
    b) Emitter current

c) Collector current
d) Voltage gain
Answer: c) Collector current

Small Signal Analysis

21. **In small signal analysis, what does the hybrid parameter h_{fe} represent?**
    a) Voltage gain
    b) Input resistance
    c) Current gain
    d) Output resistance
    Answer: c) Current gain
22. **The input resistance in the common-emitter configuration is typically: **
    a) High
    b) Low
    c) Infinite
    d) Zero
    Answer: b) Low
23. **The output resistance in a common-base configuration is typically: **
    a) High
    b) Low
    c) Infinite
    d) Zero
    Answer: a) High
24. In the small signal model, the resistance r_e is approximately equal to:
    a) $\frac{kT}{qI_E}$
    b) $\frac{qI_E}{kT}$
    c) $\frac{kT}{q}$
    d) $\frac{q}{kT}$
    Answer: a) $\frac{kT}{qI_E}$
25. **What is the typical value of h_{fe} for a small-signal BJT?**
    a) 10–50
    b) 50–500
    c) 500–1000
    d) Above 1000
    Answer: b) 50–500

Miscellaneous Questions

26. **Which BJT parameter determines the maximum frequency it can amplify?**
    a) $\mathbf{h_{fe}}$
    b) r_e
    c) Transition frequency (f_T)
    d) Saturation current
    Answer: c) Transition frequency ((f_T)
27. **A Darlington pair configuration has a very high:**
    a) Voltage gain
    b) Current gain
    c) Output resistance
    d) None of the above
    Answer: b) Current gain

Power and Efficiency

28. **W**

    Which parameter is used to calculate the power dissipation of a BJT?

    a) I_B

    b) I_C

    c) $V_{CE} \times I_C$

    d) $V_{BE} \times I_E$

    Answer: c) $V_{CE} \times I_C$

29. **What is the primary limitation of BJTs in high-power applications?**
    a) High input impedance
    b) Low speed
    c) Thermal runaway
    d) Low gain
    Answer: c) Thermal runaway
30. **What is the typical efficiency of a BJT in Class A operation?**
    a) 25%
    b) 50%
    c) 75%
    d) 90%
    Answer: b) 50%
31. **In power BJTs, what is the primary reason for using a heat sink?**
    a) Reduce voltage drop

b) Increase current gain
c) Dissipate heat
d) Enhance signal amplification
Answer: c) Dissipate heat

32. **The maximum power rating of a BJT is determined by:**
a) Base current only
b) Emitter current only
c) Junction temperature
d) Transition frequency
Answer: c) Junction temperature

Switching Applications

33. **In which region does a BJT operate when used as a switch?**
a) Cut-off and Active
b) Saturation and Cut-off
c) Active and Saturation
d) Breakdown and Cut-off
Answer: b) Saturation and Cut-off
34. **In the cut-off region, the base-emitter voltage V_{BE} is:**
a) Negative
b) Positive
c) Zero
d) None of the above
Answer: c) Zero
35. **What is the typical value of V_{CE}(sat) for a silicon BJT?**
a) 0.2 V
b) 0.7 V
c) 1.5 V
d) 2.0 V
Answer: a) 0.2 V
36. **What is the primary advantage of BJTs in switching applications?**
a) High voltage gain
b) Fast switching speed
c) High input impedance
d) Thermal stability
Answer: b) Fast switching speed
37. **What is the role of a base resistor in a BJT switch circuit?**
a) To limit collector current
b) To limit base current
c) To increase gain
d) To stabilize output voltage
Answer: b) To limit base current

BJT Limitations and Protection

38. **What is “thermal runaway” in a BJT?**
    a) An increase in input impedance
    b) A decrease in current gain with temperature
    c) An uncontrollable increase in collector current with temperature
    d) A sudden drop in base-emitter voltage
    Answer: c) An uncontrollable increase in collector current with temperature
39. **How can thermal runaway in a BJT be minimized?**
    a) By increasing base current
    b) By using negative feedback
    c) By increasing the emitter resistance
    d) Both b and c
    Answer: d) Both b and c
40. **What happens when the BJT operates in the breakdown region?**
    a) Normal amplification
    b) Irreversible damage
    c) Increased current gain
    d) Reduced input resistance
    Answer: b) Irreversible damage
41. **What is the safe operating area (SOA) of a BJT?**
    a) The range of collector current and voltage values where the BJT can operate reliably
    b) The maximum input voltage range
    c) The maximum frequency range
    d) None of the above
    Answer: a) The range of collector current and voltage values where the BJT can operate reliably

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Comparison with Other Devices

42. **Compared to MOSFETs, BJTs generally have:**
    a) Higher input impedance
    b) Higher switching speed
    c) Lower input impedance
    d) None of the above
    Answer: c) Lower input impedance
43. **Which device has a negative temperature coefficient for current, reducing the risk of thermal runaway?**
    a) BJT
    b) MOSFET
    c) SCR

d) UJT
Answer: b) MOSFET

44. **BJTs are preferred over MOSFETs in applications requiring:**
    a) High input impedance
    b) High power efficiency
    c) High current density
    d) Low speed
    Answer: c) High current density

Advanced Topics

45. **What is the "Early effect" in BJTs?**
    a) The increase in collector current due to a decrease in base width
    b) The delay in switching time
    c) The saturation of the base region
    d) The reverse breakdown of the collector junction
    Answer: a) The increase in collector current due to a decrease in base width
46. **What does the term "h-parameters" signify in BJTs?**
    a) Hybrid parameters
    b) Heat parameters
    c) High-frequency parameters
    d) Hysteresis parameters
    Answer: a) Hybrid parameters
47. **The maximum allowable voltage across the collector-emitter junction is called:**
    a) Breakdown voltage
    b) Threshold voltage
    c) Saturation voltage
    d) Biasing voltage
    Answer: a) Breakdown voltage
48. **Which region has the shortest carrier lifetime in a BJT?**
    a) Base
    b) Emitter
    c) Collector
    d) None of the above
    Answer: a) Base
49. **The punch-through effect occurs when:**
    a) The collector current saturates
    b) The base width becomes very small
    c) The emitter-base junction breaks down
    d) The BJT enters the cut-off region
    Answer: b) The base width becomes very small
50. **In high-frequency BJTs, the transition frequency f_T is defined as:**
    a) The frequency at which current gain becomes 1
    b) The frequency at which power gain becomes 1

c) The maximum operating frequency
d) None of the above
Answer: a) The frequency at which current gain becomes 1

ChatGPT

1. Introduction to Instruments

1. **What is the primary purpose of a multimeter?**
   a) To amplify signals
   b) To measure voltage, current, and resistance
   c) To generate a sine wave
   d) To regulate voltage
   Answer: b)

2. **Which instrument is used to measure alternating current (AC)?**
   a) Voltmeter
   b) Ammeter
   c) Function generator
   d) Oscilloscope
   Answer: b)

3. **An oscilloscope is mainly used to measure:**
   a) Resistance
   b) Time-varying signals
   c) Static electricity
   d) Power dissipation
   Answer: b)

4. **What is the unit of resistance measured by an ohmmeter?**
   a) Volt
   b) Ohm
   c) Ampere
   d) Farad
   Answer: b)

5. **Which of the following is NOT a function of a function generator?**
   a) Generating sine waves
   b) Generating square waves
   c) Measuring resistance
   d) Generating triangular waves
   Answer: c)

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2. Forward Bias Operation

6. **What happens to a diode under forward bias?**
   a) It blocks current
   b) It allows current to flow
   c) It stores energy
   d) It reverses polarity
   Answer: b)

7. **In forward bias, the positive terminal of the power source is connected to:**
   a) Cathode of the diode
   b) Anode of the diode
   c) Gate of the diode
   d) Base of the diode
   Answer: b)

8. **Which of the following is true for a forward-biased diode?**
   a) Reverse voltage increases
   b) Resistance decreases
   c) Current flow decreases
   d) Junction capacitance increases
   Answer: b)

9. **What is the typical forward voltage drop for a silicon diode?**
   a) 0.2V
   b) 0.7V
   c) 1.5V
   d) 2V
   Answer: b)

10. **Which application commonly uses forward-biased diodes?**
    a) Voltage regulation
    b) Signal rectification
    c) Light emission
    d) Noise filtering
    Answer: b)

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3. Reverse Bias Operation

11. **In reverse bias, the diode allows:**
    a) High current flow
    b) Leakage current only
    c) Zero current flow
    d) Maximum current flow
    Answer: b)

12. **Reverse breakdown in a diode occurs when:**
    a) Voltage exceeds a critical value
    b) Current is maximum
    c) Current is zero
    d) Power supply is off
    Answer: a)

13. **What is the leakage current in a reverse-biased diode?**
    a) Very high
    b) Very low
    c) Equal to forward current
    d) Equal to breakdown current
    Answer: b)

14. **A Zener diode in reverse bias is used for:**
    a) Amplification
    b) Rectification
    c) Voltage regulation
    d) Signal modulation
    Answer: c)

15. **What does avalanche breakdown in a diode indicate?**
    a) Diode failure
    b) Controlled current flow
    c) High reverse voltage
    d) Low resistance
    Answer: c)

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4. Voltage Regulation Using Zener Diode (Load Resistor Constant)

16. **What is the primary application of a Zener diode?**
    a) Signal amplification
    b) Voltage regulation
    c) Current rectification
    d) Wave shaping
    Answer: b)

17. **In a Zener diode voltage regulator, what is the role of the load resistor?**
    a) To increase voltage
    b) To limit current
    c) To amplify current
    d) To decrease voltage
    Answer: b)

18. **What is the characteristic of a Zener diode in reverse breakdown?**
    a) Variable voltage
    b) Constant voltage
    c) Constant current
    d) No current flow
    Answer: b)

19. **Which of the following parameters should be constant in a Zener diode regulator circuit?**
    a) Current
    b) Load voltage
    c) Load power
    d) Input resistance
    Answer: b)

20. **At reverse breakdown, the Zener diode acts as a:**
    a) Short circuit
    b) Voltage stabilizer
    c) Current amplifier
    d) Power source
    Answer: b)

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5. Voltage Regulation Using Zener Diode (Input Voltage Constant)

21. **What happens to the Zener diode when the input voltage increases?**
    a) Current through the Zener increases
    b) Voltage across the Zener increases
    c) Both current and voltage increase
    d) The Zener diode breaks down
    Answer: a)

22. **In a Zener diode circuit, if the load resistance decreases, the load current:**
    a) Increases
    b) Decreases
    c) Remains constant
    d) Becomes zero
    Answer: a)

23. **Which component protects the Zener diode from high current in a regulator circuit?**
    a) Resistor
    b) Capacitor
    c) Inductor
    d) Transformer
    Answer: a)

24. **The input voltage for a Zener diode regulator should be:**
    a) Equal to Zener voltage
    b) Higher than Zener voltage
    c) Lower than Zener voltage
    d) Independent of Zener voltage
    Answer: b)

25. **What happens if the input voltage drops below the Zener voltage?**
    a) Zener stops regulating
    b) Zener breaks down
    c) Zener current increases
    d) Load current increases
    Answer: a)

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6. Half-Wave Rectifier

26. **In a half-wave rectifier, the output waveform contains:**
    a) Positive and negative cycles
    b) Only positive cycles
    c) Only negative cycles
    d) Both cycles amplified
    Answer: b)

27. **Which component is essential in a half-wave rectifier circuit?**
    a) Transformer
    b) Diode
    c) Capacitor
    d) Inductor
    Answer: b)

28. **What is the primary drawback of a half-wave rectifier?**
    a) High efficiency
    b) Low efficiency
    c) High ripple factor
    d) Low ripple factor
    Answer: c)

29. **The efficiency of a half-wave rectifier is approximately:**
    a) 40.6%
    b) 50%
    c) 75%
    d) 90%
    Answer: a)

30. **What is the frequency of the output signal in a half-wave rectifier, given a 50 Hz AC input?**
    a) 25 Hz
    b) 50 Hz
    c) 100 Hz
    d) 75 Hz
    Answer: b)

7. Full-Wave Rectifier

31. **What is the output frequency of a full-wave rectifier with a 60 Hz input?**
    a) 30 Hz
    b) 60 Hz
    c) 120 Hz
    d) 90 Hz
    Answer: c)

32. **Which configuration is commonly used in full-wave rectifiers?**
    a) Half-wave rectifier
    b) Bridge rectifier
    c) Single diode rectifier
    d) Inductive rectifier
    Answer: b)

33. **What is the peak inverse voltage (PIV) for each diode in a bridge rectifier?**
    a) Equal to input voltage
    b) Twice the input voltage
    c) Half the input voltage
    d) Independent of input voltage
    Answer: a)

34. **The ripple factor of a full-wave rectifier is:**
    a) Higher than half-wave rectifier
    b) Lower than half-wave rectifier
    c) Equal to half-wave rectifier
    d) Zero
    Answer: b)

35. **Full-wave rectifiers are preferred over half-wave rectifiers because they:**
    a) Have lower efficiency
    b) Have less ripple
    c) Use fewer components
    d) Operate only with AC
    Answer: b)

8. Positive and Negative Clipper Circuits

36. **What is the function of a clipper circuit?**
    a) Amplifies signals
    b) Removes specific portions of a waveform
    c) Generates a sine wave
    d) Stabilizes voltage
    Answer: b)

37. **In a positive clipper, the clipped part of the signal is:**
    a) Above a reference level
    b) Below a reference level
    c) Equal to the reference level
    d) Independent of the reference level
    Answer: a)

38. **A negative clipper circuit removes:**
    a) Positive peaks
    b) Negative peaks
    c) Entire signal
    d) Noise
    Answer: b)

39. **Which component is critical in a clipper circuit?**
    a) Diode
    b) Capacitor
    c) Inductor
    d) Transformer
    Answer: a)

40. **Clippers are used in applications requiring:**
    a) Signal shaping
    b) Amplification
    c) Energy storage
    d) Rectification
    Answer: a)

9. Positive and Negative Clamper Circuits

41. **What is the primary function of a clamper circuit?**
    a) Shift the DC level of a signal
    b) Remove noise
    c) Stabilize voltage
    d) Amplify signals
    Answer: a)

42. **In a positive clamper, the signal is shifted:**
    a) Downward
    b) Upward
    c) Horizontally
    d) Inversely
    Answer: b)

43. **What additional component is used in a clamper circuit besides a diode?**
    a) Resistor
    b) Capacitor
    c) Transformer
    d) Inductor
    Answer: b)

44. **A negative clamper circuit shifts the signal:**
    a) Upward
    b) Downward
    c) Horizontally
    d) Inversely
    Answer: b)

45. **Clamper circuits are often used in:**
    a) Signal processing
    b) Power supply circuits
    c) Data transmission
    d) Energy storage
    Answer: a)

General Questions

46. **Which type of diode is used in voltage regulation circuits?**
    a) Schottky diode
    b) Zener diode
    c) Light-emitting diode
    d) Tunnel diode
    Answer: b)

47. **What happens when the forward voltage of a diode exceeds the threshold?**
    a) It conducts current
    b) It blocks current
    c) It overheats
    d) It reverses polarity
    Answer: a)

48. **Rectifiers are primarily used to convert:**
    a) AC to DC
    b) DC to AC
    c) AC to AC
    d) DC to DC
    Answer: a)

49. **In a circuit, the purpose of a resistor is to:**
    a) Limit current flow
    b) Store energy
    c) Generate signals
    d) Increase voltage
    Answer: a)

50. **What does the term "ripple factor" measure in rectifiers?**
    a) Voltage regulation
    b) Smoothness of output
    c) Amplification factor
    d) Current rating
    Answer: b)
