P.S.R. ENGINEERING COLLEGE

(An Autonomous Institution, Affiliated to Anna University, Chennai)
Approved by AICTE, New Delhi & Accredited by National Board of Accreditation (NBA)
Accredited by NAAC with A+ Grade, recognized under 2(f) and 12(b) of the UGC Act, 1956.
An ISO 9001: 2015 Certified Institution

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

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

QUESTION BANK

Programme:	B.E.	Branch	Electronics and Communication Engineering
Academic Year:	2024-2025	Year/Semester/ Section	II/III/I
Course Code:	231EC31	Course Name	Electronic Devices And Circuits
Course Tutor:	Dr.P.Marichamy, Professor/ECE ; Mr.B.Senthilkumar AP/ECE.		

UNIT 1 – SEMICONDUCTOR DEVICES

PART-A MCQ QUESTIONS AND ANSWERS

1. A Semiconductor has _____temperature coefficient of resistance
   A. Positive
   B. Zero
   C. Negative
   D. None of the above

2. The band gap of Germanium at room temperature is
   A. 2.3ev
   B. 0.7ev
   C. 0.3ev
   D. 1.1ev

3. A Semiconductor generally has _____valence electrons
   A.4
   B.5
   C.3
   D.1

4. The minimal energy required to excite electrons from valence band to conduction band in an insulator is
   A.1ev
   B.0ev
   C.<2ev
   D.>3ev

5. What happens to the resistance of a semiconductor when its temperature is increased
   A. It will increase
   B. It will decrease
   C. It remains unchanged
   D. None of the above

6. To obtain n type semiconductor, the impurity added to a pure semiconductor Is
   A. Trivalent
   B. Tetravalent

C. Pentavalent
D. None of these

7. A Trivalent impurity has _____valence electrons

A. 3
B. 4
C. 5
D. 6

8. As the doping to a pure semiconductor increases, the bulk resistance of the semiconductor
A. Increases
B. Decreases
C. Remains same
D. Becomes very high

9. The no of semiconductor layers and no of junctions in PN Junction diode is
A. 2 and 3 respectively
B. 3 and 2 respectively
C. 1 and 2 respectively
D. None of the above

10. The reverse bias PN junction has
A. Very low resistance
B. Very large current flow
C. Narrow depletion region
D. Almost no current

11. The leakage current in PN junction diode is due to
A. Majority careers
B. Minority careers
C. junction capacitance
D. None of the above

12. A Zener diode is used as
A. Voltage regulator
B. An Amplifier
C. A rectifier
D. A multivibrator

13. A Zener diode utilizes _____characteristic of its operation
A. Forward
B. Reverse
C. Both forward and reverse
D. None of the above

14. In the breakdown region, a Zener diode behaves like a _____ source
A. Constant current
B. Constant voltage
C. Constant resistance
D. None of the above

15. The ripple factor of a half wave rectifier is

A. 2
B. 1.21
C. 0.48
D. 2.31

16. The rectification efficiency of full wave and half wave rectifiers are
A. 70.6% and 45.7% respectively
B. 81.2% and 40.6% respectively
C. 78.9% and 42.6% respectively
D. 82.4% and 41.6% respectively

17. The equivalent DC output voltage of a half wave rectifier is ____the equivalent DC output voltage of a full wave rectifier
A. Equal
B. Not related
C. Double
D. Half

18. In a full wave rectifier with input frequency 50Hz, the
Output frequency is
A. 50Hz
B. 100Hz
C. 25Hz
D. Zero

19. The number of diodes used in half wave
Rectifier is
A. 3
B. 4
C. 1
D. 2

20. The number of semiconductor layers and junctions in Thyristor is
A. 3 and 4 respectively
B. 4 and 3 respectively
C. 2 and 3 respectively
D. 3 and 2 respectively

21. When SCR starts conducting, _____ loses all control
A. Anode
B. Cathode
C. Gate
D. None of the above

22. The SCR is turned off by
A. Reducing gate voltage to zero
B. Reducing anode voltage to zero
C. Reverse biasing the gate
D. None of the above

23. The control element of SCR is
A. Anode
B. Cathode

C. Gate
D. none

24. SCR is a____ triggered device
A. voltage
B. Both voltage and current
C. current
D. None

25. TRIAC has 3 terminals which are
A. Anode, cathode, Gate terminals
B. Two main terminals and gate terminal
C. Anode, cathode and drain terminals
D. none of the above

26. A TRIAC is equal to 2 SCRs in
A. Series
B. Parallel
C. Inverse parallel
D. Inverse series

27. A TRIAC is a _____ switch
A. unidirectional
B. Bidirectional
C. Mechanical
D. None

28. The no of terminals and PN junctions in DIAC are
A. 3 and 2 respectively
B. 2 and 3 respectively
C. 3 and 3 respectively
D. 2 and 2 respectively

29. The device not having Gate terminal is
A. DIAC
B. TRIAC
C. SCR
D. FET

30. A DIAC is ____ switch
A. An AC
B. A DC
C. A mechanical
D. None

31. A normal way to turn on DIAC is by
A. Gate voltage
B. Gate current
C. Breakover voltage
D. None

32. ____ current is the leakage current that flows through a Photodiode with no light as input
A. Photo
B. Dark

C. Saturation
D. Detector

33. Photodiode operates in ____ condition
A. Reverse bias
B. Forward bias
C. Both forward and reverse bias
D. None

34. The designing of _____ surface is done with _____
A. Active, SiO2
B. Non-Active, SiO2
C. Active, SiO4
D. Non- Active, SiO4

35. Which process of electron-hole pair is responsible for light emission?
A. Generation
B. Movement
C. recombination
D. Diffusion

36. LED is based on the phenomenon of
A. Photoelectricity
B. Electroluminescence
C. Photoluminescence
D. All the above

37. LED is constructed by depositing ____ semiconductor layers on the substrate
A. 2
B. 3
C. 4
D. 5

38. UJT can be used as relaxation oscillator because of ____ in its static emitter characteristic curve
A. Cut-off region
B. Saturation region
C. positive resistance region
D. negative resistance region

39. What are the terminals of UJT
A. Collector, base, emitter
B. Gate, source, drain
C. Gate, base1, base2
D. Emitter, base1, base2

40. Emitter in UJT is
A. Centrally located
B. Close to Base1
C. Close to Base 2
D. None

41. The tunnelling involves
A. acceleration of electrons in p side
B. Movement of electrons from n side conduction band to p side valence band

C. Charge distribution management in both bands
D. Positive slope characteristic of diode

42. Which of the following diodes exhibit negative resistance in I-V characteristics
A. Schottky diode
B. PIN diode
C. Tunnel diode
D. Zener diode

43. The region between peak point and valley point in tunnel diode is
A. Positive resistance region
B. Negative resistance region
C. Cut-off region
D. Saturation region

44.PIN diode consists of
A. heavily doped p region, lightly doped n region Separated by a high resistivity material
B. lightly doped p region, lightly doped n region Separated by a low resistivity material
C. Heavily doped p and n regions separated by a high Resistivity material
D. heavily doped p region, lightly doped n region separated by a low resistivity material

45._____ Is a type of photodetector that converts optical to electrical signals

A. PIN Diode
B. Avalanche diode
C. Schottky diode
D. Zener diode

46. The barrier capacitance in varactor diodes
A. Increases with Increase in reverse bias voltage
B. Decreases with Increase in reverse bias voltage
C. Decreases with Increase in forward bias voltage
D. do not vary with reverse bias voltage

47. In varactor diodes, the junction capacitance is controlled by _____supply in _____ mode
A. External, forward biased
B. External, reverse biased
C. Internal, forward biased
D. Internal, reverse biased

48. Which of the following parameters of a silicon Schottky diode is higher than that of the corresponding PN junction diode
A. Forward voltage drop
B. Reverse recovery current
C. Reverse recovery time
D. Reverse leakage current

49. Schottky diode has ____ forward voltage-drop and
_____switching speed
A. High, Low
B. Low, High
C. moderate, High
D. Low, moderate

50. Which of the following diodes uses a metal-semiconductor junction?
A. Zener diode
B. Schottky diode
C. Varactor diode
D. None of the above

PART B – TWO MARKS

1. **What is the energy band structure of semiconductors?**

   - Semiconductors have a valence band and conduction band separated by a small energy gap (~1 eV). Electrons can jump from the valence band to the conduction band when external energy is applied.

2. **Name the two types of semiconductors.**

   - **Intrinsic**: Pure semiconductor with no impurities.
   - **Extrinsic**: Doped semiconductor to enhance its conductivity (n-type or p-type).
     Application: Used in electronic devices like transistors and diodes.

3. **What is a PN junction diode and its application?**

   - A PN junction diode allows current to flow in one direction (forward bias) and blocks it in the reverse direction.
     Application: Used in rectifiers, clamping circuits, and switching applications.

4. **What is the working principle of a Zener diode, and where is it used?**

   - A Zener diode operates in reverse bias and allows current to flow when the reverse voltage exceeds the Zener breakdown voltage.
     Application: Voltage regulation and overvoltage protection in circuits.

5. **What is unique about a Tunnel diode, and where is it applied?**

   - A Tunnel diode exhibits negative resistance due to quantum tunneling, enabling high-speed operation.
     Application: Used in high-frequency oscillators, amplifiers, and microwave devices.

6. **What is a PIN diode, and in what applications is it used?**

   - A PIN diode has an intrinsic (undoped) layer between P and N regions, providing low capacitance and high-speed switching.
     Application: Used in RF switching, attenuators, and photodetectors.

7. **What is a Varactor diode used for?**

   - A Varactor diode acts as a variable capacitor whose capacitance changes with the reverse voltage.
     Application: Used in voltage-controlled oscillators, RF tuning circuits, and frequency modulators.

8. **What is the main feature of a Schottky diode, and where is it used?**

- A Schottky diode has a low forward voltage drop (~0.2–0.3V) and fast switching speed.
  Application: Used in high-speed switching circuits, power rectification, and RF applications.

9. **What is the difference between half-wave and full-wave rectification?**

- A half-wave rectifier converts only one-half of the AC cycle to DC, while a full-wave rectifier converts both halves.
  Application: Half-wave rectifiers are used in low-power applications; full-wave rectifiers are used in DC power supplies.

10. **What is an SCR (Silicon Controlled Rectifier), and where is it commonly applied?**

An SCR is a four-layer, three-terminal device used as a switch, controlled by a gate signal.
Application: Used in power control, motor speed control, and rectification in high-voltage applications.

11. **What is the function of a UJT (Unijunction Transistor), and where is it used?**

A UJT is a three-terminal semiconductor device that is used primarily as a trigger for thyristors.
Application: Used in triggering circuits, pulse generation, and timing applications.

12. **What is the difference between a DIAC and a TRIAC, and where are they used?**

A DIAC is a bidirectional trigger device, while a TRIAC is a bidirectional switch that can be triggered by a gate signal.
Application: DIAC is used in triggering TRIACs, while TRIAC is used in AC power control, dimmers, and motor speed controllers.

13. **What is the principle of an LED (Light Emitting Diode), and what are its applications?**

An LED emits light when a forward current passes through the PN junction, causing electron-hole recombination.
Application: Used in display systems, indicator lights, and general lighting.

14. **What is the function of a photodiode, and where is it used?**

A photodiode converts light into electrical current and operates in reverse bias.
Application: Used in light-sensing applications, solar cells.

15. **What is the difference between diffusion current and drift current?**

Drift Current	**Diffusion current**
1. Developed due to potential gradient.	1. Developed due to charge concentration gradient.
2. Phenomenon found both in semiconductors and metals.	2. Only in semiconductors

16. **Compare a full-wave rectifier and a half-wave rectifier.**

Parameter	Full-Wave Rectifier	Half-Wave Rectifier
Definition	Converts both positive and negative halves of the AC input into DC.	Converts only the positive half of the AC input into DC.
Number of Diodes	2 diodes (for center-tap transformer) or 4 diodes (bridge rectifier).	1 diode.
Average Output Voltage	Higher (nearly double that of half-wave rectifier).	Lower (about 40.6% of the peak input voltage).
Ripple Frequency	Twice the input AC frequency (2 × f).	Same as input AC frequency (f).
Advantages	1. Higher efficiency.	1. Simple and low cost.
	2. Higher average output voltage.	2. Requires only one diode.
	3. Smoother output with less ripple.	3. Lower transformer requirement (no center-tap).
	4. Reduced filter size due to higher ripple frequency.	4. Suitable for low-power applications.

PART-C

1. Explain the Construction, and operation PN Junction diode under forward and reverse bias
2. Explain the operation and Characteristics of UJT
3. Explain the symbol, construction, operation, and Characteristics of SCR
4. Describe the construction, operation, and characteristics of i) DIAC ii) TRIAC
5. Describe the construction, operation, and characteristics of i) LED ii) Photodiode
6. Explain about LASER diode and Varactor diode
7. Explain about PIN Diode and Schottky diode

UNIT 2 – BJT

PART-A MCQ QUESTIONS AND ANSWERS

1. Which type of charge carriers dominate in an NPN transistor?
   a) Electrons
   b) Holes
   c) Protons
   d) Neutrons
   Answer: a) Electrons

2. In a PNP transistor, the majority charge carriers are:
   a) Electrons
   b) Holes
   c) Ions
   d) Protons
   Answer: b) Holes

3. What is the function of a base in a transistor?
   a) Provides majority carriers
   b) Controls the current between collector and emitter
   c) Supplies power
   d) Acts as a heat sink
   Answer: b) Controls the current between collector and emitter

4. Which transistor configuration provides the highest current gain?
   a) Common Emitter (CE)
   b) Common Base (CB)
   c) Common Collector (CC)
   d) None of the above
   Answer: a) Common Emitter (CE)

5. Which configuration has the highest input impedance?
   a) Common Emitter (CE)
   b) Common Base (CB)
   c) Common Collector (CC)
   d) None of the above
   Answer: c) Common Collector (CC)

6. In which transistor configuration is the output in phase with the input?
   a) CE
   b) CB
   c) CC
   d) None of the above
   Answer: c) CC

7. In an NPN transistor, current flows from the:
   a) Base to emitter
   b) Emitter to collector
   c) Collector to base
   d) Base to collector
   Answer: b) Emitter to collector

8. The output characteristics of a common emitter configuration show:

a) Voltage amplification
b) Current gain
c) Phase shift
d) Both voltage and current gain
Answer: d) Both voltage and current gain

9. Which transistor configuration is known for the highest voltage gain?
   a) CE
   b) CB
   c) CC
   d) All of the above
   Answer: a) CE

10. Biasing in a transistor is used to:
    a) Provide thermal stability
    b) Operate the transistor in the active region
    c) Increase output
    d) Both a and b
    Answer: d) Both a and b

11. Which biasing method offers the best stability?
    a) Fixed bias
    b) Self bias
    c) Voltage divider bias
    d) Collector feedback bias
    Answer: c) Voltage divider bias

12. Which factor indicates the stability of a biasing method?
    a) Gain factor
    b) Stability factor
    c) Temperature coefficient
    d) Resistance factor
    Answer: b) Stability factor

13. What is the purpose of the emitter in a BJT?
    a) To control current
    b) To emit electrons or holes
    c) To amplify current
    d) To act as a collector
    Answer: b) To emit electrons or holes

14. Which configuration is typically used for impedance matching?
    a) CE
    b) CB
    c) CC
    d) None of the above
    Answer: c) CC

15. What is the typical current gain (β) of a common emitter configuration?
    a) 0-5
    b) 5-20
    c) 20-500
    d) 1000+
    Answer: c) 20-500

16. The common collector configuration is also called a:
    a) Voltage follower
    b) Current follower
    c) Emitter follower
    d) Collector follower
    Answer: c) Emitter follower

17. Which configuration has the lowest output impedance?
    a) CE
    b) CB
    c) CC
    d) None of the above
    Answer: c) CC

18. The h-parameter for input resistance in the CE configuration is represented by:
    a) h11
    b) h21
    c) h12
    d) h22
    Answer: a) h11

19. What is the phase difference between input and output in a common emitter configuration?
    a) 0 degrees
    b) 90 degrees
    c) 180 degrees
    d) 270 degrees
    Answer: c) 180 degrees

20. In the active region, the base-emitter junction of a BJT is:
    a) Forward biased
    b) Reverse biased
    c) Unbiased
    d) None of the above
    Answer: a) Forward biased

21. In the common base configuration, the current gain (α) is typically:
    a) 1
    b) Less than 1
    c) Greater than 1
    d) Negative
    Answer: b) Less than 1

22. Which transistor configuration has a voltage gain less than 1?
    a) CE
    b) CB
    c) CC
    d) None of the above
    Answer: c) CC

23. Which transistor region is used for amplification?
    a) Active region
    b) Saturation region
    c) Cutoff region

d) None of the above
Answer: a) Active region

24. In a fixed bias circuit, stability is:
    a) High
    b) Medium
    c) Low
    d) Very high
    Answer: c) Low

25. What is the symbol for the current gain in the common base configuration?
    a) β
    b) α
    c) hfe
    d) γ
    Answer: b) α

26. Which method of biasing is commonly used in commercial circuits?
    a) Fixed bias
    b) Self bias
    c) Voltage divider bias
    d) None of the above
    Answer: c) Voltage divider bias

27. The emitter current in a transistor is the sum of:
    a) Base current and collector current
    b) Collector current and leakage current
    c) Base current and input current
    d) None of the above
    Answer: a) Base current and collector current

28. The saturation region of a transistor is used for:
    a) Amplification
    b) Switching
    c) Current control
    d) Voltage regulation
    Answer: b) Switching

29. In a common base configuration, the output is taken from:
    a) Emitter
    b) Base
    c) Collector
    d) None of the above
    Answer: c) Collector

30. Which biasing method is considered thermally unstable?
    a) Voltage divider bias
    b) Fixed bias
    c) Self bias
    d) Collector feedback bias
    Answer: b) Fixed bias

31. Which component is necessary in the biasing circuit to maintain the operating point?
    a) Capacitor

b) Resistor
c) Transformer
d) Inductor
Answer: b) Resistor

32. Which transistor configuration is typically used in RF amplifiers?
a) CE
b) CB
c) CC
d) None of the above
Answer: b) CB

33. Which of the following affects the stability factor of a transistor circuit?
a) β of the transistor
b) Collector current
c) Temperature
d) All of the above
Answer: d) All of the above

34. The voltage gain of a common emitter amplifier depends on:
a) Input voltage
b) Load resistance
c) Biasing voltage
d) Base current
Answer: b) Load resistance

35. In which configuration is the voltage gain typically low, but current gain high?
a) CE
b) CB
c) CC
d) All of the above
Answer: c) CC

36. What is the main advantage of a self-bias circuit?
a) Simple construction
b) High gain
c) High stability
d) Low cost
Answer: c) High stability

37. The cutoff region of a transistor is used for:
a) Switching
b) Amplification
c) Oscillation
d) None of the above
Answer: a) Switching

38. Which transistor configuration is commonly used in oscillator circuits?
a) Common Collector
b) Common Base
c) Common Emitter
d) None of the above
Answer: c) Common Emitter

39. The output characteristics of a BJT indicate the relationship between:
    a) Base current and collector current
    b) Collector current and collector-emitter voltage
    c) Emitter current and base current
    d) None of the above
    Answer: b) Collector current and collector-emitter voltage

40. The common base configuration is mainly used for:
    a) Voltage amplification
    b) Current amplification
    c) Impedance matching
    d) High-frequency applications
    Answer: d) High-frequency applications

41. In a self-bias configuration, the feedback is provided through the:
    a) Emitter resistor
    b) Collector resistor
    c) Base resistor
    d) None of the above
    Answer: a) Emitter resistor

42. The input impedance of a common base configuration is:
    a) Low
    b) High
    c) Very high
    d) Moderate
    Answer: a) Low

43. The stability factor (S) is defined as the change in collector current (Ic) with respect to:
    a) Change in base-emitter voltage (Vbe)
    b) Change in temperature
    c) Change in base current (Ib)
    d) Change in collector-emitter voltage (Vce)
    Answer: c) Change in base current (Ib)

44. The main purpose of using h-parameters in transistor analysis is to:
    a) Simplify calculations
    b) Provide a detailed model
    c) Determine frequency response
    d) Measure temperature changes
    Answer: a) Simplify calculations

45. What happens to the collector current (Ic) when the base current (Ib) is increased in a common emitter configuration?
    a) Ic decreases
    b) Ic remains constant
    c) Ic increases
    d) Ic becomes zero
    Answer: c) Ic increases

46. The load line analysis of a transistor helps in determining:
    a) The operating point
    b) The gain of the amplifier
    c) The maximum frequency

d) None of the above
Answer: a) The operating point

47. In a BJT, the emitter-base junction is always:
    a) Forward biased in active mode
    b) Reverse biased in active mode
    c) Unbiased
    d) Forward biased in cutoff mode
    Answer: a) Forward biased in active mode

48. Which configuration has the lowest voltage gain?
    a) Common Emitter
    b) Common Collector
    c) Common Base
    d) None of the above
    Answer: b) Common Collector

49. The common emitter configuration is characterized by a phase shift of:
    a) 90 degrees
    b) 180 degrees
    c) 270 degrees
    d) 0 degrees
    Answer: b) 180 degrees

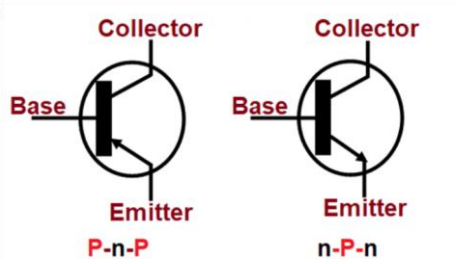
50. The output impedance of a common base configuration is:
    a) Low
    b) High
    c) Very high
    d) Moderate
    Answer: b) High

PART B

1. **What is a BJT? Give its circuit symbol.**
   Answer:

   A Bipolar Junction Transistor (BJT) is a three-layer semiconductor device that can amplify and switch electronic signals. It consists of two p-n junctions and can be classified into two types based on the arrangement of the p-type and n-type materials: NPN and PNP transistors.

   - **NPN Transistor**: In an NPN transistor, the layers are arranged in the order of N-type (Emitter), P-type (Base), and N-type (Collector). Current flows from the collector to the emitter, controlled by the base current.
   - **PNP Transistor**: In a PNP transistor, the layers are arranged in the order of P-type (Emitter), N-type (Base), and P-type (Collector). Current flows from the emitter to the collector, controlled by the base current.



2. **Define doping.**
   Answer: Doping is the intentional introduction of impurities into an intrinsic semiconductor to modify its electrical properties. This process increases the number of charge carriers (electrons or holes) and can create n-type (with donor impurities) or p-type (with acceptor impurities) semiconductors.
3. **If the base current in a transistor is 30 microamps when the emitter current is 2 mA. What are the values of α and β?**

$$\beta = \frac{I_C}{I_B} = \frac{I_E - I_B}{I_B}$$

Where $I_E = 2\,\text{mA} = 2000\,\mu A$ and $I_B = 30\,\mu A$.

$$I_C = I_E - I_B = 2000\,\mu A - 30\,\mu A = 1970\,\mu A$$

$$\beta = \frac{1970\,\mu A}{30\,\mu A} \approx 65.67$$

- To find α (alpha), use the formula:

$$\alpha = \frac{I_C}{I_E} = \frac{1970\,\mu A}{2000\,\mu A} \approx 0.985$$

4. **Can you construct a transistor by simply placing two isolated diodes back to back? If not, why?**
   Answer: No, you cannot construct a transistor by placing two isolated diodes back to back. A transistor requires a specific arrangement of three layers of semiconductor material (either p-n-p or n-p-n) to create two pn junctions that can control current flow between the collector and emitter. Isolated diodes do not provide the necessary interactions between the layers to function as a transistor.

5. **Define the various h-parameters in a transistor.**
   Answer: The h-parameters are small-signal parameters used to model a transistor's behavior:
   - **Input Impedance**: The ratio of input voltage to input current with output shorted.
   - **Reverse Voltage Gain**: The ratio of output voltage to input voltage with output shorted (typically negligible).
   - **Forward Current Gain**: The ratio of output current to input current with input open (often denoted as β).
   - **Output Admittance**: The ratio of output current to output voltage with input open.

6. **What is meant by biasing a transistor?**
   Answer: Biasing a transistor refers to the process of applying a DC voltage to the transistor's terminals to set its operating point in the active region. This ensures the transistor operates correctly for amplification or switching purposes, preventing distortion of the input signal.

7. **Compare CE, CC, and CB configurations.**
   Answer:
   - **Common Emitter (CE)**:
     - High voltage and power gain.
     - Inverted output.
     - Used in amplifiers and switches.
   - **Common Collector (CC)**:
     - Also known as an emitter follower.
     - High current gain, low voltage gain.
     - Non-inverted output.
     - Used for impedance matching.
   - **Common Base (CB)**:
     - Low input impedance, high output impedance.
     - Used for high-frequency applications.
     - Inverted output, low voltage gain.

8. **Among CE, CB, and CC, which one is most popular? Why?**
   Answer: The Common Emitter (CE) configuration is the most popular due to its high voltage and power gain, making it suitable for general amplification applications. Its ability to invert the signal and provide significant gain makes it widely used in audio and radio frequency amplifiers.

9. **Give some applications of BJT.**
   Answer:
   - Amplifiers (audio, RF, etc.)
   - Oscillators
   - Signal modulation
   - Switching applications (e.g., in digital circuits)
   - Voltage regulators

10. **The transistor has an emitter current of 10mA and α is 0.98. Find the value of base and collector currents.**

    - Given:
      $I_E = 10\,\text{mA} = 10000\,\mu A$
      $\alpha = 0.98$
    - To find the collector current (I_C):

      $$I_C = \alpha \times I_E = 0.98 \times 10\,\text{mA} = 9.8\,\text{mA}$$

    - To find the base current (I_B):

      $$I_B = I_E - I_C = 10\,\text{mA} - 9.8\,\text{mA} = 0.2\,\text{mA} = 200\,\mu A$$

PART C

1. Explain the working principles of NPN and PNP transistor
2. Discuss the input and output characteristics and h-parameters of a transistor in CE configuration
3. Discuss the input and output characteristics and h-parameters of a transistor in CB configuration
4. Discuss the input and output characteristics and h-parameters of a transistor in CC configuration
5. Explain the Self-bias in the transistor and evaluate its stability factor. (7)
6. Explain the Fixed bias in the transistor and evaluate its stability factor. (7)

UNIT-3 FIELD EFFECT TRANSISTORS

PART –A

1. **What does FET stand for?**
   a) Field Emission Transistor
   b) Field Effect Transistor
   c) Frequency Effect Transistor
   d) None of the above
   Answer: **b) Field Effect Transistor**

2. **What is the primary advantage of using FETs over BJTs?**
   a) Higher current gain
   b) Higher input impedance
   c) Lower noise
   d) Simplicity in construction
   Answer: **b) Higher input impedance**

3. **Which type of FET is commonly used in analog applications?**
   a) JFET
   b) MOSFET
   c) IGFET
   d) Both a and b
   Answer: **d) Both a and b**

4. **In a JFET, what controls the flow of current through the channel?**
   a) Base current
   b) Gate voltage
   c) Emitter current
   d) Collector voltage
   Answer: **b) Gate voltage**

5. **What type of channel does an N-channel JFET have?**
   a) P-type
   b) N-type
   c) Both P-type and N-type
   d) None of the above
   Answer: **b) N-type**

6. **What is the basic structure of a MOSFET?**
   a) Three terminals with a gate, source, and drain
   b) Two terminals with a gate and drain
   c) Two terminals with a source and collector
   d) Four terminals
   Answer: **a) Three terminals with a gate, source, and drain**

7. **What are the two main types of MOSFETs?**
   a) Depletion and Enhancement
   b) N-type and P-type
   c) Low Power and High Power
   d) None of the above
   Answer: **a) Depletion and Enhancement**

8. **In an enhancement-type MOSFET, how is the channel formed?**
   a) By applying a negative gate voltage
   b) By applying a positive gate voltage
   c) By using a resistor

d) By connecting a diode
Answer: **b) By applying a positive gate voltage**

9. **Which of the following is true about a depletion-type MOSFET?**
   a) It conducts current when no voltage is applied to the gate.
   b) It can be turned off by applying a positive gate voltage.
   c) It is normally off when no gate voltage is applied.
   d) None of the above.
   Answer: **c) It is normally off when no gate voltage is applied.**

10. **What is the threshold voltage in a MOSFET?**
    a) The minimum gate voltage needed to form a conducting channel
    b) The maximum gate voltage allowed
    c) The voltage at which the MOSFET turns off
    d) The voltage drop across the drain
    Answer: **a) The minimum gate voltage needed to form a conducting channel**

11. **The transfer characteristic of a MOSFET is a plot of:**
    a) Drain current vs. gate voltage
    b) Drain voltage vs. gate voltage
    c) Source current vs. drain current
    d) Base current vs. collector current
    Answer: **a) Drain current vs. gate voltage**

12. **What does the term 'pinch-off' refer to in JFET operation?**
    a) The channel is completely closed
    b) The channel is fully open
    c) The condition where the drain current becomes constant
    d) None of the above
    Answer: **c) The condition where the drain current becomes constant**

13. **In terms of structure, how does a MOSFET differ from a JFET?**
    a) MOSFET has a gate insulated from the channel
    b) JFET has a gate insulated from the channel
    c) MOSFET has no gate
    d) JFET has no gate
    Answer: **a) MOSFET has a gate insulated from the channel**

14. **What is the main drawback of using JFETs compared to BJTs?**
    a) Lower input impedance
    b) Higher power consumption
    c) Limited frequency response
    d) Complex biasing
    Answer: **c) Limited frequency response**

15. **In which region does a JFET operate as an amplifier?**
    a) Cut-off region
    b) Active region
    c) Saturation region
    d) Breakdown region
    Answer: **b) Active region**

16. **What happens to the drain current in a JFET when the gate-source voltage is decreased?**
    a) Increases
    b) Decreases
    c) Remains constant

d) Becomes zero
Answer: **b) Decreases**

17. **What is the primary function of the gate in a MOSFET?**
    a) To provide power
    b) To control the flow of current
    c) To emit electrons
    d) To connect to ground
    Answer: **b) To control the flow of current**
18. **Which type of MOSFET is usually faster in switching applications?**
    a) Depletion-mode MOSFET
    b) Enhancement-mode MOSFET
    c) JFET
    d) BJT
    Answer: **b) Enhancement-mode MOSFET**

19. **What is the main application of a JFET?**
    a) Digital circuits
    b) Audio amplifiers
    c) High-frequency applications
    d) Linear amplifiers
    Answer: **d) Linear amplifiers**

20. **Which MOSFET is preferred for low-power applications?**
    a) Depletion-mode MOSFET
    b) Enhancement-mode MOSFET
    c) JFET
    d) None of the above
    Answer: **b) Enhancement-mode MOSFET**

21. **What is the typical input impedance of a JFET?**
    a) Low
    b) Medium
    c) High
    d) Very low
    Answer: **c) High**

22. **The MOSFET is primarily controlled by which type of voltage?**
    a) Drain-Source voltage
    b) Gate-Source voltage
    c) Collector-Emitter voltage
    d) Base-Emitter voltage
    Answer: **b) Gate-Source voltage**

23. **In a JFET, the drain current is primarily controlled by:**
    a) Gate current
    b) Gate voltage
    c) Source voltage
    d) Drain voltage
    Answer: **b) Gate voltage**

24. **Which parameter indicates the transconductance in a FET?**
    a) g_m
    b) I_D
    c) V_{GS}
    d) V_{DS}

Answer: **a)g_m**

25. **What is the main purpose of the substrate in a MOSFET?**
    a) To enhance current flow
    b) To provide thermal stability
    c) To act as a gate
    d) To serve as a support for the channel
    Answer: **d) To serve as a support for the channel**

26. **How does a JFET differ from a BJT in terms of control?**
    a) JFET is controlled by current; BJT is controlled by voltage
    b) JFET is controlled by voltage; BJT is controlled by current
    c) Both are controlled by current
    d) Both are controlled by voltage
    Answer: **b) JFET is controlled by voltage; BJT is controlled by current**

27. **What is the major disadvantage of using MOSFETs compared to BJTs?**
    a) Lower switching speed
    b) Higher cost
    c) Greater susceptibility to damage from static electricity
    d) None of the above
    Answer: **c) Greater susceptibility to damage from static electricity**

28. **In a MOSFET, the channel is created by:**
    a) Doping the substrate
    b) Applying a voltage to the gate
    c) Shorting the source and drain
    d) None of the above
    Answer: **b) Applying a voltage to the gate**

29. **What happens to the threshold voltage of a MOSFET as temperature increases?**
    a) Increases
    b) Decreases
    c) Remains constant
    d) Becomes negative
    Answer: **b) Decreases**

30. **Which device has a lower output impedance, a JFET or a BJT?**
    a) JFET
    b) BJT
    c) Both have similar output impedance
    d) None of the above
    Answer: **b) BJT**

31. **Which parameter is primarily responsible for the switching speed of MOSFETs?**
    a) Gate capacitance
    b) Drain-source voltage
    c) Gate-source voltage
    d) Body effect
    Answer: **a) Gate capacitance**

32. **In a JFET, the pinch-off voltage is:**
    a) The maximum gate voltage
    b) The minimum gate voltage for conduction
    c) The voltage at which the current saturates
    d) The voltage at which the device turns off
    Answer: **c) The voltage at which the current saturates**

33. **What is the transfer characteristic curve of a MOSFET typically shaped like?**
    a) Linear
    b) Exponential
    c) Parabolic
    d) Logarithmic
    Answer: **c) Parabolic**

34. **What type of substrate is used in an N-channel MOSFET?**
    a) N-type
    b) P-type
    c) Both N-type and P-type
    d) No substrate
    Answer: **b) P-type**

35. **Which MOSFET type is used for digital applications?**
    a) Depletion-mode MOSFET
    b) Enhancement-mode MOSFET
    c) Both types
    d) None of the above
    Answer: **b) Enhancement-mode MOSFET**

36. **In which configuration is a JFET most commonly used?**
    a) Common Base
    b) Common Source
    c) Common Drain
    d) Common Emitter
    Answer: **b) Common Source**

37. **What is a common application of a JFET?**
    a) Switching applications
    b) Amplification
    c) Oscillation
    d) Power conversion
    Answer: **b) Amplification**

38. **In a depletion-mode MOSFET, increasing the gate-source voltage will:**
    a) Increase current flow
    b) Decrease current flow
    c) Keep current flow constant
    d) Completely cut off current flow
    Answer: **b) Decrease current flow**

39. **What is a major characteristic of MOSFETs?**
    a) Low input impedance
    b) High thermal stability
    c) High input capacitance
    d) High noise margin
    Answer: **d) High noise margin**

40. **The output characteristics of a JFET consist of:**
    a) A linear region only
    b) A saturation region only
    c) A cutoff and saturation region
    d) Cutoff, saturation, and active regions
    Answer: **d) Cutoff, saturation, and active regions**

41. **What happens to the drain current in a MOSFET when the gate-source voltage is above the threshold voltage ?**

a) It remains zero
b) It increases
c) It decreases
d) It oscillates
Answer: **b) It increases**

42. **Which of the following is true for both JFET and BJT?**
a) Both are voltage-controlled devices
b) Both have high input impedance
c) Both can be used as amplifiers
d) Both are primarily used in digital circuits
Answer: **c) Both can be used as amplifiers**

43. **Which parameter is not directly associated with JFET operation?**
a) VGS
b) Gate current
c) Drain current
d) Drain-source voltage
Answer: **b) Gate current**

44. **In a MOSFET, which terminal is responsible for controlling the conductivity of the channel?**
a) Source
b) Drain
c) Gate
d) Substrate
Answer: **c) Gate**

45. **What is the effect of temperature on the threshold voltage of a MOSFET?**
a) increases with temperature
b) decreases with temperature
c) remains constant
d) Temperature has no effect
Answer: **b) decreases with temperature**
46. **What type of transistor is preferred for switching applications?**
a) JFET
b) BJT
c) MOSFET
d) Both a and c
Answer: **c) MOSFET**

47. **Which device is typically used in high-frequency applications?**
a) JFET
b) BJT
c) MOSFET
d) Both a and c
Answer: **d) Both a and c**

48. **In a MOSFET, when the gate-source voltage is equal to the threshold voltage , the channel is:**
a) Fully open
b) Fully closed
c) Just forming
d) None of the above
Answer: **c) Just forming**

49. **What is the maximum gate-source voltage rating for typical MOSFETs?**
a) 1V
b) 10V
c) 20V

d) It varies based on the specific device
Answer: **d) It varies based on the specific device**

PART-B

1. **Why is FET known as a unipolar device?**
   Answer: FET is known as a unipolar device because it uses only one type of charge carrier (either electrons or holes) for conduction. In an N-channel FET, conduction is carried out by electrons, while in a P-channel FET, conduction is carried out by holes. This contrasts with bipolar junction transistors (BJTs), which use both electrons and holes for conduction.

2. **Distinguish FET and MOSFET.**
   Answer:

   - **FET (Field Effect Transistor)**: A generic term that includes JFETs, MOSFETs, and other types. It operates by controlling the flow of current with an electric field.
   - **MOSFET (Metal-Oxide-Semiconductor Field Effect Transistor)**: A specific type of FET that has an insulated gate, allowing for very high input impedance and low power consumption. It can be further classified into enhancement-mode and depletion-mode MOSFETs.

3. **What is pinch-off voltage in JFET?**
   Answer: The pinch-off voltage (Vp) in a JFET is the gate-source voltage at which the conductive channel is completely constricted, and the drain current (ID)becomes constant despite increasing drain-source voltage (V_{DS}). It marks the transition from the saturation region to the cutoff region in the output characteristics.

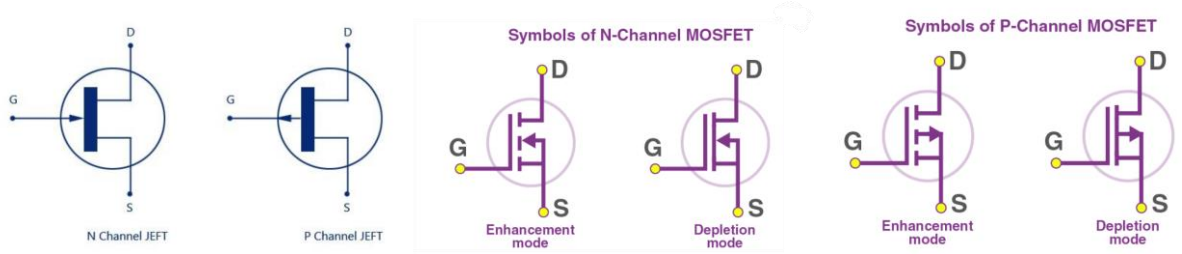
4. **Define cut-off voltage.**
   Answer: Cut-off voltage refers to the gate-source voltage (V_{GS}) at which the JFET stops conducting current. For an N-channel JFET, it is the negative gate voltage required to fully deplete the channel of charge carriers, resulting in zero drain current (I_D)

5. **Give the classification of FET.**
   Answer: FETs can be classified as follows:

   - **JFET (Junction Field Effect Transistor)**
     - N-channel JFET
     - P-channel JFET
   - **MOSFET (Metal-Oxide-Semiconductor Field Effect Transistor)**
     - Enhancement-mode MOSFET
     - Depletion-mode MOSFET
   - **Other Types**:
     - IGFET (Insulated Gate FET)
     - HEMT (High Electron Mobility Transistor)

6. **Why do depletion regions not touch at pinch-off?**
   Answer: In a JFET, the depletion regions at the gate ends do not touch at pinch-off because the electric field from the gate creates a channel that remains conductive up to a certain point. At pinch-off, the channel narrows, but the depletion regions expand and maintain a gap that prevents the complete closure of the channel. This allows for a constant drain current as long as the drain-source voltage is increased beyond the pinch-off voltage.

7. **Give the symbol of N-channel and P-channel JFET and MOSFET.**
   Answer:



8. **What is FET? Classify it.**
   Answer: FET (Field Effect Transistor) is a type of transistor that controls the flow of current using an electric field. It is classified into:

   - **JFET (Junction Field Effect Transistor)**
     - N-channel JFET
     - P-channel JFET
   - **MOSFET (Metal-Oxide-Semiconductor Field Effect Transistor)**
     - Enhancement-mode MOSFET
     - Depletion-mode MOSFET

9. **What are the operating regions in the drain characteristics of FET?**
   Answer: The operating regions in the drain characteristics of a FET are:

   - **Cut-off Region**: No conduction occurs, and the drain current (I_D) is zero.
   - **Saturation Region**: The drain current remains constant with increasing drain-source voltage
   - **Triode (Linear) Region**: The FET operates as a linear amplifier, and the drain current increases with V_{DS}.

10. **What are the parameters used in the characteristics of JFET?**
    Answer: The key parameters used in the characteristics of JFET are:

    - **Gate-Source Voltage (V_{GS})**: The voltage applied between the gate and the source terminal.
    - **Drain-Source Voltage (V_{DS})**: The voltage applied between the drain and source terminals.
    - **Drain Current (I_D)**: The current flowing through the drain terminal.
    - **Pinch-off Voltage (V_P)**: The gate-source voltage at which the channel is pinched off.
    - **Transconductance (g_m)**The ratio of change in drain current to change in gate-source voltage.
    - **Output Resistance (r_o)**: The resistance looking into the drain when the JFET is in the saturation region.

PART-C

1. Explain the construction and operation of N-Channel JFET
2. Explain the drain and transfer characteristics of N-Channel JFET
3. Explain the construction, operation, and characteristics of Enhancement type MOSFET
4. Explain the construction, operation, and characteristics of Depletion type MOSFET
5. Compare JFET with MOSFET

UNIT 4 -FEEDBACK AMPLIFIERS AND OSCILLATORS

PART-A

1. **What is a feedback amplifier?**
   a) An amplifier that only amplifies the input signal
   b) An amplifier that uses a portion of its output to influence its input
   c) An amplifier that operates without external power
   d) An amplifier that only works in a digital system
   Answer: b) An amplifier that uses a portion of its output to influence its input

2. **Which type of feedback amplifier reduces the gain and improves stability?**
   a) Positive feedback amplifier
   b) Negative feedback amplifier
   c) Both a and b
   d) None of the above
   Answer: b) Negative feedback amplifier

3. **In a voltage feedback amplifier, what is the output signal proportional to?**
   a) Input voltage
   b) Input current
   c) Both input voltage and current
   d) None of the above
   Answer: a) Input voltage

4. **Which type of feedback amplifier provides better input impedance?**
   a) Voltage feedback
   b) Current feedback
   c) Shunt feedback
   d) Series feedback
   Answer: d) Series feedback

5. **What is the main characteristic of positive feedback?**
   a) Stabilizes the system
   b) Increases the gain
   c) Decreases the bandwidth
   d) All of the above
   Answer: b) Increases the gain

6. **What is the condition for oscillation in a feedback oscillator?**
   a) $A \cdot \beta < 1$
   b) $A \cdot \beta = 1$
   c) $A + \beta = 0$
   d) $A - \beta = 0$
   Answer: b) $A \cdot \beta = 1$

7. **What does the term "phase shift" refer to in oscillators?**
   a) The delay in time between input and output
   b) The change in amplitude of the signal
   c) The difference in phase angle between input and output signals
   d) The frequency of the output signal
   Answer: c) The difference in phase angle between input and output signals

8. **Which of the following is a type of RC oscillator?**
   a) Hartley oscillator

b) Wien bridge oscillator
c) Colpitts oscillator
d) All of the above
Answer: d) All of the above

9. **What is the primary component used in a Wien bridge oscillator?**
   a) Inductor
   b) Resistor and capacitor
   c) Diode
   d) Transformer
   Answer: b) Resistor and capacitor

10. **Which type of feedback is used in a Hartley oscillator?**
    a) Series feedback
    b) Shunt feedback
    c) Voltage feedback
    d) Current feedback
    Answer: c) Voltage feedback

11. **In a Colpitts oscillator, what components form the tank circuit?**
    a) Resistor and inductor
    b) Inductor and capacitor
    c) Capacitors in series
    d) Inductor and transformer
    Answer: b) Inductor and capacitor

12. **What type of feedback does a crystal oscillator typically use?**
    a) Positive feedback
    b) Negative feedback
    c) No feedback
    d) None of the above
    Answer: a) Positive feedback

13. **What is one of the advantages of negative feedback in amplifiers?**
    a) Increased distortion
    b) Decreased linearity
    c) Improved stability
    d) Reduced bandwidth
    Answer: c) Improved stability

14. **What is the role of the feedback resistor in a feedback amplifier?**
    a) To increase input impedance
    b) To control the gain
    c) To decrease output impedance
    d) To increase distortion
    Answer: b) To control the gain

15. **Which oscillator configuration uses an LC tank circuit?**
    a) Wien bridge oscillator
    b) Hartley oscillator
    c) Phase shift oscillator
    d) All of the above
    Answer: b) Hartley oscillator

16. **What is the basic function of a feedback loop in an amplifier?**
    a) To amplify the output signal
    b) To reduce noise in the signal
    c) To control the gain and improve performance

d) To introduce delay
Answer: c) To control the gain and improve performance

17. **Which oscillator uses a resistor and a capacitor in a bridge configuration?**
    a) Colpitts oscillator
    b) Wien bridge oscillator
    c) Hartley oscillator
    d) Crystal oscillator
    Answer: b) Wien bridge oscillator

18. **In a phase shift oscillator, how many RC stages are typically used?**
    a) One
    b) Two
    c) Three
    d) Four
    Answer: c) Three

19. **What is the primary purpose of an oscillator?**
    a) To amplify a signal
    b) To produce a periodic waveform
    c) To filter signals
    d) To detect signals
    Answer: b) To produce a periodic waveform

20. **What is the function of a crystal in a crystal oscillator?**
    a) To act as a voltage regulator
    b) To provide frequency stability
    c) To amplify the signal
    d) To decrease distortion
    Answer: b) To provide frequency stability

PART B

1. **What is a feedback amplifier? Describe its basic function.**
   Answer: A feedback amplifier is an amplifier that takes a portion of its output signal and feeds it back to its input. Its basic function is to control gain, improve stability, and reduce distortion.

2. **Differentiate between negative feedback and positive feedback in amplifiers.**
   Answer: Negative feedback reduces the gain of an amplifier, improves stability, and decreases distortion. Positive feedback increases the gain and can lead to instability and oscillations.

3. **What are the advantages of using negative feedback in amplifiers?**
   Answer: The advantages include improved stability, reduced distortion, increased bandwidth, and enhanced linearity of the amplifier.

4. **If the input voltage to a feedback amplifier is 5V and the feedback voltage is 1V, what is the output voltage?**
   Answer: Output voltage = Input voltage + Feedback voltage = 5V + 1V = **6V**.

5. **What are the different types of feedback used in amplifiers?**
   Answer: The different types of feedback are:
   - Voltage feedback
   - Current feedback
   - Series feedback
   - Shunt feedback

6. **Define the term "oscillation" in the context of feedback systems.**
   Answer: Oscillation refers to the repeated variation of a quantity, such as voltage or current, in a feedback system, resulting in a periodic waveform.

7. **For a feedback oscillator to sustain oscillation, what condition must be met regarding gain and phase shift(Barkhausen Criterion)?**
   Answer: The product of the gain (A) and feedback factor (β) must equal unity, and the total phase shift around the loop must be 0° or 360°.

8. **A Wien bridge oscillator has resistors of 10kΩ and capacitors of 100nF. What is the frequency of oscillation?**
   Answer: Frequency $f = \frac{1}{2\pi RC}$
   $f = \frac{1}{2\pi(10\times10^{3})(100\times10^{-9})}$
   $f \approx 159.15 \text{ Hz}$

9. **Explain the concept of "phase shift" in oscillators.**
   Answer: Phase shift refers to the difference in phase angle between the input and output signals in an oscillator. For sustained oscillations, the total phase shift around the loop should be a multiple of 360°.

10. **What is the primary function of the tank circuit in a Hartley oscillator?**
    Answer: The primary function of the tank circuit (composed of an inductor and a capacitor) is to determine the frequency of oscillation by storing and transferring energy between the inductor and capacitor.

11. **In a Colpitts oscillator, if the inductance is 1.5 mH and the capacitance is 10 nF, what is the oscillation frequency?**
    Answer: Frequency $f = \frac{1}{2\pi\sqrt{LC}}$
    $f = \frac{1}{2\pi\sqrt{(1.5\times10^{-3})(10\times10^{-9})}}$
    $f \approx 129.89 \text{ kHz}$

12. **Define a crystal oscillator and explain its key feature.**
    Answer: A crystal oscillator is a type of oscillator that uses the mechanical resonance of a vibrating crystal (usually quartz) to create an electrical signal with a precise frequency. Its key feature is its frequency stability.

13. **In a feedback amplifier, if the open-loop gain is 100 and the feedback factor is 0.01, what is the closed-loop gain?**
    Answer: Closed-loop gain $A_{CL} = \frac{A}{1+A\beta} = \frac{100}{1+100\cdot0.01} = \frac{100}{2} = 50.$

14. **How many stages are typically used in a phase shift oscillator?**
    Answer: A phase shift oscillator typically uses **three RC stages** to achieve a total phase shift of 180°.

15. **Calculate the output voltage of a feedback amplifier if the input voltage is 12V and the feedback ratio is 0.2.**
    Answer: Output voltage = Input voltage × (1 + Feedback ratio)
    Output voltage = $12V \times (1 + 0.2) = 12V \times 1.2 = 14.4V$.

PART-C

1. Draw the block diagrams of the four possible feedback topologies and explain.
2. Explain voltage shunt, current shunt feedback amplifiers
3. Explain Voltage Series and Current series feedback amplifiers
4. Develop the working of the Hartley oscillator and derive the expression for the frequency of oscillation
5. Develop the working of Colpitts and derive the expression for frequency of oscillation
6. Derive the expression for the general form of an LC oscillator and also Explain the operation of the oscillator Types of LC oscillators and derive the expression of its frequency of oscillation.
7. Explain the operation of the RC phase shift oscillator with a neat circuit diagram and derive the expression of the frequency of oscillation.

UNIT 5 -TUNED AMPLIFIERS AND LARGE SIGNAL AMPLIFIER

PART A

1. **What is a tuned amplifier primarily used for?**
   a) Amplifying low-frequency signals
   b) Amplifying high-frequency signals
   c) Amplifying a specific range of frequencies
   d) Amplifying all frequencies equally
   Answer: c) Amplifying a specific range of frequencies

2. **Which of the following describes a single-tuned amplifier?**
   a) Uses one inductor and one capacitor for tuning
   b) Uses two inductors
   c) Uses multiple capacitors
   d) Does not require tuning
   Answer: a) Uses one inductor and one capacitor for tuning

3. **What is the primary function of a double-tuned amplifier?**
   a) To amplify two frequencies simultaneously
   b) To provide better selectivity and gain
   c) To reduce distortion
   d) To increase the bandwidth
   Answer: b) To provide better selectivity and gain

4. **In a tuned amplifier, the quality factor (Q) indicates:**
   a) The total gain of the amplifier
   b) The selectivity and bandwidth of the amplifier
   c) The input impedance
   d) The output power
   Answer: b) The selectivity and bandwidth of the amplifier

5. **What is the frequency response of a tuned amplifier?**
   a) A flat line across all frequencies
   b) A sharp peak at the resonant frequency
   c) A gradual decline at all frequencies
   d) Random fluctuations
   Answer: b) A sharp peak at the resonant frequency

6. **What distinguishes a voltage amplifier from a power amplifier?**
   a) Voltage amplifiers provide higher output current
   b) Power amplifiers have higher voltage gain
   c) Power amplifiers can drive loads, while voltage amplifiers cannot
   d) Voltage amplifiers consume more power
   Answer: c) Power amplifiers can drive loads, while voltage amplifiers cannot

7. **Why is impedance matching important in amplifiers?**
   a) To reduce noise
   b) To maximize power transfer
   c) To increase voltage gain
   d) To decrease distortion
   Answer: b) To maximize power transfer

8. **Class A amplifiers operate with:**
   a) The transistor conducting for less than 180° of the input cycle
   b) The transistor conducting for the entire input cycle
   c) The transistor conducting for 360° of the input cycle
   d) None of the above
   Answer: b) The transistor conducting for the entire input cycle

9. **What is a key feature of Class B amplifiers?**
   a) They have high linearity
   b) They conduct for more than 180° of the input cycle
   c) They are highly efficient
   d) They do not provide power gain
   Answer: c) They are highly efficient

10. **Class AB amplifiers are characterized by:**
    a) Zero conduction during one half of the cycle
    b) Conduction for less than 180° but more than 0° of the input cycle
    c) Conduction for the entire input cycle
    d) No output distortion
    Answer: b) Conduction for less than 180° but more than 0° of the input cycle

11. **In a push-pull class B amplifier, how are the transistors configured?**
    a) In series
    b) In parallel
    c) Complementary pairs
    d) All of the above
    Answer: c) Complementary pairs

12. **What advantage does a complementary symmetry push-pull amplifier have?**
    a) Higher power output
    b) Lower distortion
    c) Simpler design
    d) All of the above
    Answer: d) All of the above

13. **Which type of amplifier is known for low distortion and high efficiency?**
    a) Class A
    b) Class B
    c) Class C
    d) Class AB
    Answer: b) Class B

14. **What is the main disadvantage of a Class A amplifier?**
    a) Low power output
    b) High distortion
    c) High efficiency
    d) Limited bandwidth
    Answer: a) Low power output

15. **A Class C amplifier is primarily used in:**
    a) Audio applications
    b) Radio frequency applications
    c) Linear applications
    d) Digital applications
    Answer: b) Radio frequency applications

16. **What is the function of the tank circuit in a tuned amplifier?**
    a) To filter out unwanted frequencies
    b) To store energy
    c) To match impedances
    d) To amplify signals
    Answer: b) To store energy

17. **What is the relationship between gain and frequency in a tuned amplifier?**
    a) Gain is constant across frequencies
    b) Gain decreases linearly with frequency
    c) Gain peaks at the resonant frequency and decreases outside this frequency
    d) Gain is not affected by frequency
    Answer: c) Gain peaks at the resonant frequency and decreases outside this frequency

18. **In which amplifier class does the output signal exhibit the least linearity?**
    a) Class A
    b) Class B
    c) Class AB
    d) Class C
    Answer: d) Class C

19. **What is the typical efficiency of a Class A amplifier?**
    a) 50%
    b) 25%
    c) 75%
    d) 100%
    Answer: b) 25%

20. **What is the output stage of a push-pull amplifier primarily designed to do?**
    a) Increase voltage gain
    b) Drive large loads
    c) Decrease power consumption
    d) Isolate the input from the output
    Answer: b) Drive large loads

PART B

1. **List any two advantages of transformer coupled Class A amplifier circuit.**
   Answer:

- **Impedance Matching**: Transformer coupling allows for better impedance matching between the amplifier and the load, leading to improved power transfer.
- **Isolation**: It provides electrical isolation between the input and output, reducing the risk of feedback and noise interference.

2. **Define Distortion.**
   Answer: Distortion refers to the alteration of the original shape or waveform of an electrical signal, resulting in output that does not accurately represent the input. It can be caused by non-linearities in the amplifier's response, leading to harmonics or unwanted frequencies in the output signal.

3. **Define conversion efficiency.**
   Answer: Conversion efficiency is the ratio of the output power delivered to the load to the total input power supplied to the amplifier. It is usually expressed as a percentage and indicates how effectively an amplifier converts DC power into usable AC output power.

4. **What is meant by cross-over distortion? How can it be eliminated?**
   Answer: Cross-over distortion occurs in push-pull amplifiers when one transistor turns off before the other turns on, leading to a brief period where there is no output during the transition. This results in distortion at low signal levels. It can be eliminated by:

   - Adding a slight bias to the transistors, ensuring they remain on during the transition.
   - Using Class AB biasing to minimize the conduction gap.

5. **What are the disadvantages of complementary symmetry power amplifiers?**
   Answer:

- **Thermal Runaway**: The use of complementary transistors can lead to thermal instability if not properly managed.
- **Complexity**: They require more complex biasing circuits compared to single-ended designs.
- **Crossover Distortion**: While biasing can reduce it, crossover distortion can still occur if not designed properly.

6. **Distinguish Large & Small Signal Amplifiers.**
   Answer:

- **Large Signal Amplifiers**: These amplifiers are designed to amplify high-level signals, often used in power applications (e.g., driving speakers). They can handle large variations in signal amplitude without significant distortion.
- **Small Signal Amplifiers**: These amplifiers are designed for low-level signals, where linearity is crucial. They are often used in the early stages of communication systems, where small variations in signal amplitude are amplified.

7. **List the classification of large signal amplifiers.**
   Answer: Large signal amplifiers are classified into:

- Class A
- Class B
- Class C
- Class AB
- Push-Pull amplifiers

8. **What are the advantages and disadvantages of Class B Power Amplifier?**
   Answer:

- **Advantages**:
  - High efficiency (up to 78.5%) compared to Class A.
  - Less heat generation.
- **Disadvantages**:
  - Non-linear distortion at low output levels (crossover distortion).
  - Requires biasing circuits to mitigate distortion.

9. **Compare Class A, B, C & AB Amplifiers.**
   Answer:

Class	Conduction Angle	Efficiency	Distortion	Applications
A	360° (Full cycle)	25-30%	Low	Audio amplifiers, linear applications
B	180° (Half cycle)	50-78.5%	Moderate	RF applications, audio applications
C	< 180°	Up to 90%	High	RF power amplifiers, transmitters
AB	180-360°	50-70%	Low	Audio amplifiers, high-fidelity applications

10. **Define Transition Time.**
    Answer: Transition time is the time taken for an amplifier's output signal to change from a low state to a high state (or vice versa) in response to a change in the input signal. It is a critical parameter in determining the bandwidth and speed of an amplifier.

PART C

1. Explain the operation of Class B complementary symmetry push-pull amplifier and derive its efficiency
2. Show the circuit of a Series fed and transformer coupled class A amplifier and explain how conversion efficiency is improved using the circuit.
3. Briefly explain the operation of the Class B push-pull power amplifier and derive its efficiency