EC6202 ELECTRONIC DEVICES AND CIRCUITS

TWO MARK QUESTIONS WITH ANSWERS

UNIT-I - PN JUNCTION DEVICES

1. What is depletion region in PN junction?

The region around the junction from which the mobile charge carriers (electrons and holes) are depleted is called as depletion region. Since this region has immobile ions, which are electrically charged, the depletion region is also known as space charge region.

2. Give the other names of depletion region?

i. Space charge region ii. Transition region

3. What is barrier potential?

The oppositely charged ions present on both sides of PN junction an electric potential is established across the junction even without any external voltage source which is termed as barrier potential.

4. What is meant by biasing a PN junction?

Connecting a PN junction to an external voltage source is biasing a PN junction.

5. What are the types of biasing a PN junction?

1. Forward bias 2. Reverse bias

6. What is forward bias and reverse bias in a PN junction?

When positive terminal of the external supply is connected to P region and negative terminal to N region, the PN junction is said to be forward biased. Under forward biased condition the PN region offers a very low resistance and a large amount of current flows through it.

7. What is reverse bias in a PN junction?

When positive terminal of the external supply is connected to N type and negative terminal to P type then the PN junction is said to be in reverse bias. Under reverse biased condition the PN region offers a very high resistance and a small amount of current flows through it.

8. What is Reverse saturation current?

The current due to the minority carriers in reverse bias is said to be reverse saturation current. This current is independent of the value of the reverse bias voltage.

9. What is an amplifier?

An amplifier is a device which produces a large electrical output of similar characteristics to that of the input parameters.

10. Why contact differences of potential exist in PN junction?

When a PN junction is formed by placing a p-type and n-type material in intimate contact, the Fermi level throughout the newly formed specimen is not constant at equilibrium. There will be transfer of electron and energy until Fermi levels in the two sides did line up. But the valence

and conduction band in p side cannot be at the same level as in n side .this shift in energy level results in contact difference of potential.

11. What is the static resistance of a diode?

Static resistance R of a diode can be defined as the ratio of voltage V across the diode to the current flowing through the diode.

R = V/ I

Where

R - Static resistance of a diode

V - Voltage across the diode

I - current across the diode

12. Define dynamic resistance.

Dynamic resistance of a diode can be defined as the ratio of change in voltage across the diode to the change in current through the diode.

r = V / I

Where

r - Dynamic resistance of a diode

V - Change in voltage across the diode

I - Change in current through the diode

13. Why do we choose q point at the center of the load line?

The operating point of a transistor is kept fixed usually at the center of the active region in order that the input signal is well amplified. If the point is fixed in the saturation region or the cut off region the positive and negative half cycle gets clipped off respectively.

14. When does a transistor act as a switch?

The transistor acts as a switch when it is operated at either cutoff region or saturation region.

15. What is biasing?

To use the transistor in any application it is necessary to provide sufficient voltage and current to operate the transistor. This is called biasing.

16. What is operating point?

For the proper operation of the transistor a fixed level of current and voltages are required. This values of currents and voltages defined at a point at which the transistor operate is called operating point.

17. Define injection laser diode.

When the emitted light is coherent, (ie) essentially monochromatic, then such a diode is referred to as an injection laser diode

PART-B

1. Explain forward bias and reverse bias in a PN junction and also VI characteristics.
2. Explain the VI characteristics of Zener diode.
3. Explain about diffusion and transient capacitance.
4. How does the Zener diode act as a voltage regulator? Explain.

5. Explain the hall wave and full wave rectifiers with relevant diagram.

UNIT II TRANSISTORS

1. What are the advantages of FET?

* Input impedance is very high. This allow high degree of Isolation between the input & output circuit.
*Current carriers are not crossing the junctions hence noise is highly reduced.
* It has a negative temperature Co-efficient of resistance. This avoids the thermal runaway.

2. What are the advantages of MOSFET compared to JFET?

The input impedance of MOSFET is higher than that of JFET.

3. What are the two modes of MOSFET?

(a) Depletion mode
(b) Enhancement mode

4. Why UJT is called so?

UJT has only one PN junction so it is called as uni-junction transistor.

5. Define turn - on time.

It is the time taken by the SCR to reach to its full conduction from the time the trigger is applied.

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6. Define breakdown voltage.

The applied voltage at which the thyristors conducts heavily without gate voltage.

7. Define latching current.

It is the minimum current required to latch the device from OFF to ON state.

8. Define holding current.

It is defined as the minimum current required holding the device into conduction.

9. What is Reverse saturation current?

The current due to the minority carriers in reverse bias is said to be reverse saturation current. This current is independent of the value of the reverse bias voltage.

10. Define turn - off time.

It is the finite time taken by the SCR after application of the reverse voltage to switch the device off.

11. What is the advantage of SCR?

Switching speed is high No moving parts. So it gives noiseless operation at high frequency it controls large current in the load by means of small gate current occupies less space.

12. Give some applications of Thyristor?

Used for power control Used for speed control of a d.c shunt motor.

13. Define finger voltage.

It is defined as the minimum voltage which is required between anode and the cathode of thyristor to trigger into conduction.

14. Define drain resistance.

It is the ratio of change in drain source voltage to change in drain current at constant gate source voltage.

15. Define inter-base resistance.

It is the resistnce offered by the silicon bar.

16. Define pinch-off voltage.

It is the drain source voltge above which the drain current becomes constant

17. What is amplification factor?

It is the product of drain résistance and transconductance **m=Rd x gm**

Rd=Drain resistance, gm=Transconductance.

PART B

1. Explain about the operation, characteristics and their applications of MOFET.
2. Explain about characteristics of JFET and their applications.
3. Explain the biasing technique for enhancement MOSFET?
4. Explain the biasing technique for D-MOSFET?
5. Describe UJT and Thyristor.

UNIT III AMPLIFIERS

1. **Define Transistor.**

Transistor consists of two junctions formed by sandwiching either P-type or Ntype semiconductor between a pair of opposite types.

2. **Write the current amplification factor for a CB transistor**.

a = Change in Collector Current at constant VCB / Change in emitter current.

3. Write the formula for input resistance in a CB transistor.

Input resistance = Change in base - emitter voltage / Change in emitter current at constant VCB.

4. Write the current amplification factor for a CE transistor.

b = Change in Collector Current / Change in base current at constant VCE.

5. **Define transistor action.**

A transistor consists of 2 coupled PN junctions. The base is a common region to both junctions and makes a coupling between them. Since the base regions are smaller, a significant interaction between junctions will be available. This is called transistor actions.

6. Define delay time.

It is defined as the time required for the current to rise from 0 to 10% of its maximum value.

7. Define rise time.

It is the time required for the current to rise from 0 to 90 percentage of the maximum value.

8. Define turn-on time.

It is the time required for the current to rise from 0 to 90 percentage of the maximum value ton = td + tr.

9. Define fall time.

It is the time required for the Collector current to fall from 90 to 10 percentages of Ics.

10. Define Storage time.

It is the time required to fall from 100 to 90 percent of Ics.

11. Define turn-off time.

It is the time required to fall from 100 to 90 percent of Ics. Toff=ts+tr.

12.Define hybrid parameters.

Any linear circuit having input and output terminals can be analysed by four parameters(one measured on ohm, one in mho and two dimensionless) called hybrid or h parameters.

13. Define power transistors.

Power transistors are those which handle a large amount of current and also dissipates large amount of power across collector base junction.

15. Define current amplification factor in CC transistor.

g =Change in emitter current /Change in base current at constant VCE

16. What are the values of input resistance in CB, CE & CC Configuration

CB - Low about 75 CE - Medium About 750 CC - Very high about 750.

17. Which is the most commonly used transistor configuration? Why?

The CE Configuration is most commonly used.

The reasons are

* High Current gain
* High voltage gain
* High power
* Moderate input to output ratio.

PART B

1. Explain the input & output Characteristic of CB configuration of a transistor?
2. Explain the input & output Characteristic of CC configuration of a transistor?
3. Explain the input & output Characteristic of CE configuration of a transistor?

4. Describe about BJT small signal model.
5. Explain about High frequency analysis.

UNIT IV MULTISTAGE AMPLIFIERS AND DIFFERENTIAL AMPLIFIER

1. What is an amplifier?

An amplifier is a device which produces a large electrical output of similar characteristics to that of the input parameters.

2. Why do we choose q point at the center of the load line?

The operating point of a transistor is kept fixed usually at the center of the active region in order that the input signal is well amplified. If the point is fixed in the saturation region or the cut off region the positive and negative half cycle gets clipped off respectively.

3. When does a transistor act as a switch?

The transistor acts as a switch when it is operated at either cutoff region or saturation region.

4. What is biasing?

To use the transistor in any application it is necessary to provide sufficient voltage and current to operate the transistor. This is called biasing.

5. What is operating point?

For the proper operation of the transistor a fixed level of current and voltages are required. This values of currents and voltages defined at a point at which the transistor operate is called operating point.

6. What is d.c load line?

The d.c load line is defined as a line on the output characteristics of the transistor which gives the value of Ic & VCE corresponding to zero signal condition.

7. What is the necessary of the coupling capacitor?

It is used to block the DC signal to the transistor amplifier. It allows a c & blocks the d c.

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8. Why is the operating point selected at the Centre of the active region?

The operating point is selected at the Centre of the active region to get to perfect amplification. Moreover there is no distortion.

9. Define an operational amplifier.

An operational amplifier is a direct-coupled, high gain amplifier consisting of one or more differential amplifier. By properly selecting the external components, it can be used to perform a variety of mathematical operations.

10. Mention the characteristics of an ideal op-amp.

* Open loop voltage gain is infinity.
* Input impedance is infinity.
* Output impedance is zero.
* Bandwidth is infinity.

* Zero offset.

11. Define input offset voltage.

A small voltage applied to the input terminals to make the output voltage as zero when the two input terminals are grounded is called input offset voltage.

12. Define slew rate.

The slew rate is defined as the maximum rate of change of output voltage caused by a step input voltage. An ideal slew rate is infinite which means that op-amp's output voltage should change instantaneously in response to input step voltage.

PART B

1. Explain the types of differential amplifiers.
2. What is meant by Neutralization? Discuss their methods.
3. Describe about Single tuned amplifiers.
4. Explain BIMOS cascade amplifier.
5. What is meant by power amplifier? Explain their types?

UNIT V FEEDBACK AMPLIFIERS AND OSCILLATORS

1. Mention any two audio frequency oscillators.

` • RC phase shift oscillator
• Wein bridge oscillator

2. What is meant by feedback?

The process of combining a fraction or part of output energy back to the input is known as feedback.

3. What is meant by negative feedback? (Or) Define degenerative feedback.

If the feedback signal applied to the input is out of phase with the input signal and thus signal decrease, it is called negative feedback. It is also known as degenerative feedback.

4. What are the types of feedback?

The different types of feedback are:

1. Positive feedback,
2. Negative feedback.

5. What is meant by positive feedback?

If feedback signal applied is in phase with the input signal and thus increases the input, it is called as positive feedback. It is also known as regenerative feedback.

6. How are the amplifiers classified based on the input and output.

The amplifier is basically classified into four types based on the input given and output obtained. They are

1).Voltage amplifier.
2). Current amplifier.
3).Transconductance amplifier.

4).Transresistance amplifier.

7. What are the effects of negative feedback?

1. It improves the stability of the circuit.
2. It improves the frequency response of the amplifier.
3. It improves the percentage of harmonic distortion.
4. It improves the signal to noise ratio (SNR).
5. It reduces the gain of the circuit.

8. What are the classifications of feedback amplifiers?

1. Current series feedback.
2. Current shunt feedback.
3. Voltage series feedback.
4. Voltage shunt feedback.

9. Define the feedback factor β.

It is the ratio between the feedback voltages to the output voltage of the amplifier.

$$\beta = V_f / V_o$$

Where, β is a feedback factor, V_f is the feedback voltage, V_o is the output voltage.

10. What is current-series feedback amplifier? (or) What is transconductance amplifier?

In a current series feedback amplifier the sampled signal is a current and the feedback signal (Which is fed in series) is a voltage.

$$Gm = I_o / Vi$$

Where, Gm = Amplifier gain.

I_o = Output current.

Ii = Input current.

11. Name two low frequency Oscillators.

1. RC phase shift. 2.Wein Bridge Oscillator.

12. Name two high frequency Oscillators.

i. Hartley Oscillator.

ii. Colpitts Oscillator.

iii.Crystal Oscillator.

13. What is voltage series feedback amplifier? (Or) What is voltage amplifier?

In a voltage series feedback amplifier the sampled signal is a voltage and feedback signal (Which is fed in series) is also a voltage.

$$A = V_o / Vi$$

Where, A = Amplifier gain.

V_o = Output voltage.

Vi = Input voltage.

14. What is Voltage shunt feedback? (Or) What is transresistance amplifier?

In voltage shunt feedback amplifier the sampled signal is a voltage and the feedback signal (Which is fed in shunt) is a current.

$$\mathbf{Rm = V_o / Ii \quad (or) \quad V_o = Rm.\ Ii}$$

Where, Rm = Amplifier gain.

V_o = Output voltage.

Ii = Input current.

15. What is current -shunt feedback amplifier? (Or) What is current amplifier?

In a current shunt feedback amplifier, the sampled signal is a current and the feedback signal (Which is fed in shunt) is a current.

$$\mathbf{A = I_o / Ii \quad (or) \quad I_o = A\ Ii.}$$

Where, A = Amplifier gain.

I_o = Output current.

Ii = Input current.

16. What is piezo electric effect?

The piezo electric Crystals exhibit a property that if a mechanical stress is applied across one face the electric potential is developed across opposite face. The inverse is also live. This phenomenon is called piezo electric effect.

17. What are the types of sinusoidal oscillator?

1. Wein Bridge Oscillator.
2. Hartley Oscillator.
3. Colpitts Oscillator.
4. Crystal Oscillator.

18**. What is an Oscillator?**

An Oscillator is a Circuit, which generates an alternating voltage of any desired frequency. It can generate an a.c output signal without requiring any externally applied input signal.

19. What are the advantages of Rc phase shift Oscillator?

i. It is best suited for generating fixed frequency signals in the audio frequency range.

ii. Simple Circuit.

iii. Pure sine wave output is possible.

20. **List the disadvantages of Rc phase shift Oscillator.**

i. It is ideal for frequency adjustment over a wide range.

ii.It requires a high β transistor to overcome losses in the network.

21. List the disadvantages of crystal Oscillator.

1. It is suitable for only low power circuits
2. Large amplitude of vibrations may crack the crystal.
3. It large in frequency is only possible replacing the crystal with another one by different frequency.

PART B

1.What are the advantages of negative feedback amplifier.
2. Explain RC-Phase shift with neat diagram
3. What is meant by Wien bridge and explain the frequency of oscillation.
4. Explain about their characteristics of Hartley and Colpitts oscillator.
5. Discuss about Crystal oscillators and their types.