QUESTION BANK

Name of the Department : **Electrical and Electronics Engineering**

Subject Code & Name : **EC 8353 & ELECTRON DEVICES AND CIRCUITS**

Year & Semester : **II & III**

UNIT I PN JUNCTION DIODES

PART-A

1. What are valence electrons?
Electron in the outer most shell of an atom is called valence electron
.

2. What is forbidden energy gap?
The space between the valence and conduction band is said to be forbidden energy gap.

3. What are conductors? Give examples?
Conductors are materials in which the valence and conduction band overlap each other so there is a swift movement of electrons which leads to conduction. Ex. Copper, silver.

4. What are insulators? Give examples?
Insulators are materials in which the valence and conduction band are far away from each other. So no movement of free electrons and thus no conduction. Ex glass, plastic.

5. What are Semiconductors? Give examples?
The materials whose electrical property lies between those of conductors and insulators are known as Semiconductors. Ex germanium, silicon.

6. What are the types of Semiconductor?
Intrinsic semiconductor
Extrinsic semiconductor.

7. What is Intrinsic Semiconductor?
Pure form of semiconductors are said to be intrinsic semiconductor. Ex germanium, silicon.

8. What is Extrinsic Semiconductor?
If certain amount of impurity atom is added to intrinsic semiconductor the resulting semiconductor is Extrinsic or impure Semiconductor.

9. What are the types of Extrinsic Semiconductor?
P-type Semiconductor
N- Type Semiconductor.

10. What is P-type Semiconductor?

The Semiconductor which are obtained by introducing penta valent impurity atom (phosphorous, antimony) are known as P-type Semiconductor.

11. What is N-type Semiconductor?

The Semiconductor which are obtained by introducing trivalent impurity atom (gallium, indium) are known as N-type Semiconductor.

12. What is doping?

Process of adding impurity to an semiconductor atom is doping. The impurity is called doping.

13. Which is majority and minority carrier in N-type Semiconductor?

Majority carrier: electrons and minority carrier: holes.

14. Which is majority and minority carrier in P-type Semiconductor?

Majority carrier: holes and minority carrier: electrons.

15. What is a PN junction diode?

A PN junction diode is a two terminal device consisting of a PN junction formed either of Germanium or Silicon crystal. A PN junction is formed by diffusing P type material to one half side and N type material to other half side.

16. What is depletion region in PN junction?

The diffusion of holes and electrons will result in difference in concentration across the junction which in turn results in the movement of the mobile charge carriers to the junction thus resulting in a region called depletion region.

17. What is barrier voltage?

Because of 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.

18. What is meant by biasing a PN junction?

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

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

Forward bias
Reverse bias

20. Define Static resistance and Dynamic resistance?

The resistance offered by the diode to DC operating conditions is called “Static resistance” and the resistance offered by the diode to AC operating conditions is called “Dynamic resistance”.

21. Explain the terms knee voltage and breakdown voltage?

Knee voltage: The forward voltage at which the current through the PN junction starts increasing rapidly is known as knee voltage. It is also called as cut-in voltage or threshold voltage.

Breakdown voltage: It is the reverse voltage of a PN junction diode at which the junction breaks down with sudden rise in the reverse current.

22. Write down and explain junction diode equation.

The equation which explains the forward and reverse characteristics of a semiconductor diode is known diode equation. The diode current is given by $I=I0\ (e^{v}\ /\ \eta VT - 1)$

Where Io = reverse saturation current

μ = 1 for Ge diodes , 2 for silicon diodes

V- External voltage

VT = volt equivalent of temperature. = T/11,600

23. Define the term the drift current.

If a steady electric field is applied across a semiconductor, it causes the free electrons to move towards the positive terminal and the holes move towards the negative terminal of the battery. This combined effect causes a current flow in the semiconductor. The current produced in this manner is known as drift current.

Drift current density due to electron

a. $Jn=qn\mu nE$

Drift current density due to holes

b. $Jp=qp\mu pE$

Jn = Drift current density due to electrons

Jp = Drift current density due to holes

q = Charge of the carrier μ n = Mobility of electrons

μ p = Mobility of holes

E = Applied electric field strength.

24. What is diffusion current?

In a semiconductor it is possible to have a non uniform distribution of carriers. A concentration gradient exists if the number of either holes or electrons is greater in one region as compared to the rest of the region. The holes and electrons then tend to move from a region of higher concentration to lower concentration region. This process is known as diffusion and the electric current produced due this process is known as diffusion current.

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

When positive of the supply is connected to P type and negative to N type then it is forward bias. When positive of the supply is connected to N type and negative to P type then it is reverse bias.

26. What is Reverse saturation current?

The current due to the minority carriers in reverse bias is said to be reverse saturation current.

27. What is reverse break down?

During reverse bias after certain reverse voltage the current through the junction increases abruptly thus breaking the crystal which is termed as reverse break down.

28. Give the diode current equation?

$I=I0\ (e^{v}\ /\ \eta VT - 1)$

I – Total diode current

I0 - reverse saturation current

V – Applied voltage

– Constant which is 1 for Germanium and 2 for Silicon

VT - voltage equivalent of temperature (VT = T/11600)

29. Give two applications of PN junction diode.

As rectifier in power supplies.

As switch in logic circuits

30. 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 side did line up. But the valence and conduction band in P - side cannot be at the at the same level as in N side. This shift in energy level results in contact difference of potential .

31. What is the total current at the junction of PN junction diode?

The total in the junction is due to the hole current entering the n material and the electron current entering the p material. Total current is given by

I=Ipn (o)+ Inp (o)

32. What is the diffusion length for holes (Lp)?

Diffusion length of holes can be said as the mean distance of travel of hole before recombination.

33. What is Zener breakdown?

Zener break down takes place when both sides of the junction are very heavily doped and consequently the depletion layer is thin and consequently the depletion layer is tin. When a small value of reverse bias voltage is applied, a very strong electric field is set up across the thin depletion layer. This electric field is enough to break the covalent bonds. Now extremely large number of free charge carriers are produced which constitute the zener current. This process is known as Zener break down.

34. What is avalanche break down?

When bias is applied, thermally generated carriers which are already present in the diode acquire sufficient energy from the applied potential to produce new carriers by removing valence electron from their bonds. These newly generated additional carriers acquire more energy from the potential and they strike the lattice and create more number of free electrons and holes. This process goes on as long as bias is increased and the number of free carriers gets multiplied. This process is termed as avalanche multiplication. Thus the break down which occurs in the junction resulting in heavy flow of current is termed as avalanche break down.

35. How does the avalanche breakdown voltage vary with temperature?
In lightly doped diode an increase in temperature increases the probability of collision of electrons and thus increases the depletion width. Thus the electrons and holes needs a high voltage to cross the junction. Thus the avalanche voltage is increased with increased temperature.

36. How does the Zener breakdown voltage vary with temperature?
In heavily doped diodes, an increase in temperature increases the energies of valence electrons, and hence makes it easier for these electrons to escape from covalent bonds. Thus less voltage is sufficient to knock or pull these electrons from their position in the crystal and convert them in to conduction electrons. Thus Zener break down voltage decreases with temperature.

37. Mention the types of junction capacitance.
-Depletion layer capacitance or transition capacitance
- Diffusion capacitance

38. Define rectifier
A rectifier is an electrical device that converts alternating current to direct current. Typically this is done with a diode because they have the ability to conduct current one way & block current from going in the other way.

39. What is a rectifier and list its types?
Rectifier is a circuit which converts a.c. to d.c. signal.
Half-wave rectifier: It is the simplest type of rectifier, which is made with just one diode.
Full-wave rectifier: This rectifier is essentially made of two half-wave rectifiers, and can be made with two diodes and an earthed centre tap on the transformer. The centre tap allows the circuit to be completed because current cannot flow through the other diode.
Bridge rectifier: A bridge rectifier makes use of four diodes in a bridge arrangement to achieve full-wave rectification

40. Define: Ripple factor.
It is the ratio of a.c voltage to d.c voltage or a.c. current to d.c. current

41. Define filter and its need.
A filter is a component that is used to reduce the ripple voltage. Generally the component used is a capacitor.

42. Define PIV, what is the value of PIV for bridge wave rectifier?
PIV is the peak voltage across the diode in the reverse direction.
PIV for HWR = Esm = πEDC | IDC = 0
PIV for FWR = 2Esm = πEDC | IDC = 0
PIV for bridge wave FWR = Esm

43. Define and explain Peak Inverse Voltage (PIV).

Peak inverse voltage is the maximum reverse voltage that can be applied to the PN junction without damage to the junction. If the reverse voltage across the junction exceeds to its peak inverse voltage, the junction may be destroyed due to excessive heat.

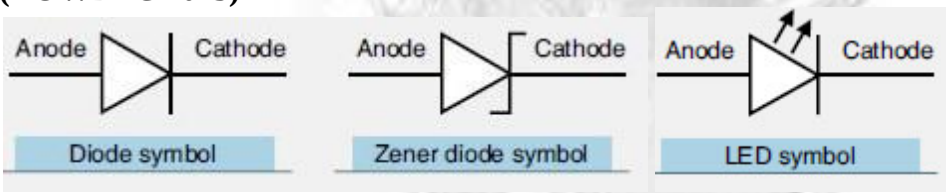
44. What is meant by transformer utilization factor?
It is the ratio of power delivered to the load to the volt ampere rating of transformer.

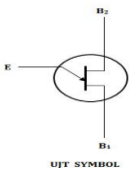
45. Mention some characteristics of LASER diode.

It is coherent i.e. there is no path difference between the waves comprising the beam.
It is monochromatic i.e. it consists of one wavelength and hence one colour only.
It is collimated i.e. emitted light waves travel parallel to each other.

46. Mention some applications of LASER diode.
Laser diodes used in variety of applications ranging from medical equipment used in surgery to consumer products like optical disk equipment, laser printers, hologram scanners, etc. Laser dides emitting visible light are used as pointers. Those emitting visible and infrared light are used to measure the distance.

47. Draw the symbol of the following device (i)PN diode (ii)Zener diode (iii)LED (iv)UJT (NOV/DEC 2015)

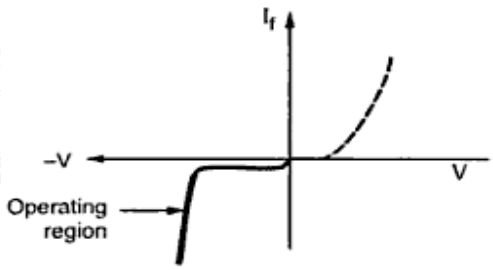
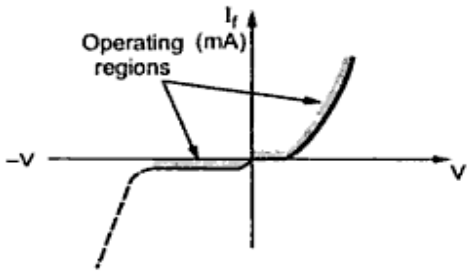
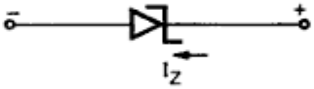
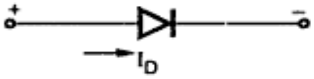




48. Applications of Zener Diode .

Clamping, voltage reference and voltage regulator

49. Compare PN diode ad Zener Diode

No.	Zener diode	P-N junction diode
1.	Operated in reverse breakdown condition.	Operated in forward biased condition and never operated in reverse breakdown condition.
2.	The characteristics lies in third quadrant. 	The characteristics lies in first quadrant. 
3.	Dynamic zener resistance is very small in reverse breakdown condition.	The diode resistance in reverse biased condition is very high.
4.	Zener diode symbol is, 	The p-n junction diode symbol is, 
5.	The conduction in zener is opposite to that of arrow in the symbol, as operated in breakdown region.	The conduction when forward biased is in same direction as that of arrow in the symbol, when forward biased.
6.	The power dissipation capability is very high.	The power dissipation capability is very low compared to zener diodes.
7.	Applications of zener diode are voltage regulator, protection circuits, voltage limiters etc.	Applications of p-n junction diode are rectifiers, voltage multipliers, clippers, clampers and many electronic devices.

PART-B

1. With neat sketch explain the construction, operation and its characteristics of PN junction diode. Also list its Advantages, disadvantages and its applications.

2. Draw the circuit diagram of a half wave rectifier for producing a positive output voltage. Explain the circuit operation and sketch the waveforms.

3. (i) Explain the action of a full wave rectifier using diodes and give waveforms of input and output voltages.

(ii) Derive an expression for a ripple factor in a full wave rectifier with resistive load.

4. Explain the working of bridge rectifier. Give the Expression for RMS current, PIV, Ripple factor and efficiency.

5. With neat diagram, explain the operation of Zener diode and its forward and reverse characteristics .Also distinguishes between Avalanche and Zener breakdowns.

6. Briefly discuss about the following:

i LED & Laser diodes.

ii Zener diode as a voltage regulator.

7. Derive the expression of Space Charge Capacitance of PN Junction diode under Reverse Bias Condition.

8. An AC supply of 220V, 50 Hz is applied to a HWR through a transformer of turn ratio 10:1. Find (i) Maximum RMS load Voltage (ii) Maximum RMS load current iii) Power delivered to the load (iv) AC power input (v) Efficiency and ripple factor (vi) PIV, ripple frequency, ripple voltage and ripple current.

9. A 230 V, 50 Hz voltage is applied to the primary of a 5:1 stepdown center-tapped transformer used in a FWR having a load of 900Ω. If the diode resistance and the secondary coil resistance together has a resistance of 100Ω determine, (i)DC voltage across the load (ii) DC current flowing through the load (iii) DC power delivered to the load (iv) PIV across each diode (v) Ripple voltage and its frequency.

10. A germanium diode has a contact potential of .2volt while the concentration of accepted impurity atoms is 3x10^20/m^3. Calculate for a reverse bias of 0.1V the width of the depletion region. If the reverse bias is increased to 10V calculate the new width of the depletion region. Assuming cross sectional area of the junction as 1mm^2 , Analyse the transition capacitance values for both the cases. Assume Ɛr=16 for germanium.

11. Estimate the ideal reverse saturation current density in a silicon PN junction at T=300K,

Consider the following parameters in the silicon pn junction. Nd=Na= 10^16cm^-3, ni= 1.5×10^10 cm^-3, Dn =25 cm2/s, Tp0= Tn0=5×10^-7s. Dp=10cm2/s, Ɛr =11.7 .Comment on the result.

12. A bridge rectifier is supplied with 230V, 50Hz supply with step down ratio of 3:1 to a resistive load of 10kΩ. If the diode forward resistance is 75Ω while the transformer secondary resistance is 10Ω. Calculate the maximum and average values of current, dc output voltage and rms voltage, efficiency, ripple factor, peak factor, form factor, PIV and TUF.

EC 8351 Electronic Devices And Circuits (2018-19) Odd semester

13. (i) The reverse saturation of a silicon PN junction diode is 10µA. Infer the diode current for the forward bias voltage of 0.6V at 25.

(ii) Brief about the terms Diffusion capacitance and transient capacitance with respect to the diode.

14. (i) A FW diode rectifier has V1=100sinωt , RL=900Ω and Rf=100Ω. Come up with the peak and dc load current, DC load voltage, the peak instantaneous diode current, the PIV on the diode, AC input power, output power, Rectification efficiency of the FW rectifier.

(ii) Determine the minimum and maximum values of the load resistance of the zener shut regulator to meet the following specifications VS=24V, VZ=10V, iZMIN=3mA, IZMAX=50mA and RL=250Ω.

15. There is an application which needs the output voltage to be regulated. Choose an appropriate diode/device, that would ensure this operation with appropriate circuit, describe how it regulates votage. Consider a specific example, design the circuit with appropriate values of components involved. State the important constraints that need to be considered.

UNIT II TRANSISTORS

PART-A

1. What do you meant by thermal runway?

Due to the self heating at the collector junction, the collector current rises. This causes damage to the device. This phenomenon is called thermal runway.

2. Why is the transistor called a current controlled device?

The output characteristics of the transistor depend on the input current. So the transistor is called a current controlled device.

3. Define current amplification factor?

It is defined as the ratio of change in output current to the change in input current at constant.

4. What is Q-point or operating point?

We set a fixed level of certain currents and voltages in a transistor. These values define a point called as the Q-point or the operating point

5. What are the requirements for biasing circuits?

The Q point must be taken at the Centre of the active region of the output characteristics. Stabilize the collector current against the temperature variations. Make the Q point independent of the transistor parameters. When the transistor is replaced, it must be of same type.

6. 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

7. What is a transistor (BJT)?
Transistor is a three terminal device whose output current, voltage and /or power is controlled by input current.

8. What are the terminals present in a transistor?
Three terminals: emitter, base, collector.

9. 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.

10. List out the different types of biasing.
Voltage divider bias
Base bias
Emitter feedback bias
Collector feedback bias
Emitter bias.

11. 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.

12. What is meant by biasing a transistor?
Transistor biasing is the process of maintaining proper flow of zero signal collector current and collector-emitter voltage during the passage of signal. Biasing keeps emitter-base junction forward biased and collector-base junction reverse biased during the passage of signal.

13. What is stability factor?

Stability factor is defined as the rate of change of collector current with respect to the rate of change of reverse saturation current.

14. Explain about the various regions in a transistor.

The three regions are active region saturation region cutoff region.

15. Explain about the characteristics of a transistor.

Input characteristics: it is drawn between input voltage & input current while keeping output voltage as constant.
Output characteristics: It is drawn between the output voltage &output current while keeping input current as constant.

16. What are the three types of configurations?

17. Which transistor configuration is widely used?
CE is widely used because, Both the voltage gain and current gain is greater than unity. The ratio of the output impedance to the input impedance is small which makes it ideal for coupling between various transistor stages and Higher power gain .

18. Which configuration is known as emitter follower and why it is named so?
CC configuration is known as emitter follower, whatever may be the signal applied at the input, may produce same signal at the output. In other words, the gain of the circuit is unity. So that the common collector circuit - the so called emitter follower is named as emitter follower. (Output follows the input)

19. What are the disadvantages of collector feedback bias?
The disadvantages of the collector feedback bias are
The collector current is high.
If the AC signal voltage gain feedback into the resistor Re , it will reduce the gain of the amplifier.

20. Why voltage divider bias is commonly used in amplifier circuit?
The voltage divider bias has the following advantages.
The operating point will be in stable position.
The stability will be considerably improved.
IC can be reduce to the collector leakage current ICO.

21. Define the stability factor S for the fixed bias circuit.
The stability factor for the fixed bias circuit is ,
1. $S = 1 + \beta$
β – Current gain of the transistor.

22. Why fixed bias circuit is not used in practice?
The stability of the fixed bias circuit is very less. Since the stability factor $S = 1 + \beta$, β is a large quantity, therefore stability is less. So it is not used in the amplified circuits.

23. What is thermal run away?
Due to the self heating at the collector junction the collector current rises. This causes damage to the device. This phenomenon is called thermal runaway.

24. What is FET?
FET is abbreviated for field effect transistor. It is a three terminal device with its output characteristics controlled by input voltage.

25. Why FET is called voltage controlled device?
The output characteristics of FET is controlled by its input voltage thus it is voltage controlled.

26. Why do you call FET as field effect transistor?
As it is a voltage controlled device as the output characteristics of FET is controlled by its input voltage it is called as field effect transistor

27. What are the two main types of FET?
1.JFET 2. MOSFET.

28. What are the terminals available in FET?
Drain 2. Source 3. Gate

29. What is JFET?
JFET- Junction field effect transistor.

30. What are the types of JFET?
N- channel JFET and P- Channel JFET

31. What are the two important characteristics of JFET?
1.Drain characteristics 2. Transfer characteristics.

32. What is Transconductance in JFET?
It is the ratio of small change in drain current to the corresponding change in drain to source voltage.

33. What is amplification factor in JFET?
It is the ratio of small change in drain to source voltage to the corresponding change in Gate to source voltage.

34. What is the disadvantage of FET over BJT?
Its relative small gain-bandwidth product in comparison with that of a conventional transistor.
Greater susceptibility to damage in its handling.
JFET has low voltage gains because of small transconductance .
Costlier when compared to BJT's.

35. What are the consideration factors that are used for the selection of an FET amplifier?
The consideration factors are

- Output voltage swing
- Distortion
- Power dissipation
- Voltage gain
- Drift drain current

36. Write the difference types of FET biasing circuits?
The FET biasing circuits are classified as,

- Gate bias,Self bias,Voltage divider bias,Current source bias ,Zero bias

37. Write the use of JFET as a voltage variable resistor?

One of the applications of voltage resistor (JFET) is to vary the gain of a multistage amplifier, as the signal level is increased. This action is called automatic gain control (AGC).

38. Mention the advantages of FET over BJT.

- The noise level is very low in FET since there are no junctions.
- FET has very high power gain
- Offers perfect isolation between input and output since it has very high input impedance.
- FET is a negative temperature coefficient device hence avoids thermal runaway.

39. Define amplification factor of JFET.

Amplification factor (μ) is defined as the ratio of small change in drain to source voltage (ΔVds) to the corresponding change in gate to source voltage (ΔVgs) at a constant drain current Id.

$\mu = \Delta Vds / \Delta Vgs$ at constant Id

40. What is a MOSFET? Mention its types.

Metal Oxide Semiconductor Field effect transistor. Its types are

Enhancement type

N- channel

P- channel

Depletion type

N- channel

P- channel

41. Why self-bias technique is not used in enhancement of type MOSFET?

The self bias technique cannot be used to establish an operating point for the enhancement type MOSFET because the voltage across RS is in a direction to reverse the gate and a forward gate bias is required.

42. What is MOSFET?

The MOSFET is an abbreviation of Metal Oxide Semiconductor Field Effect Transistor. It is a three terminal semiconductor device similar to a FET with gate insulated from the channel. Therefore it is a also known as insulated Gate (IGFET).

43. Compare the performance of CE, CB and CC.

Parameters	CB	CE	CC
Current gain (Ai)	Low	High	High
Voltage gain (Vi)	High	High	Low
Input resistance (Ri)	Low	Medium	High
Output resistance (Ro)	High	Medium	Low

44. Differentiate JFET and MOSFET.

JFET	MOSFET
Reverse bias for gate	Positive or negative gate voltage
Gate is formed as a diode	Gate is made as a capacitor
Operated only in depletion mode	Can be operated either in depletion mode or in enhancement mode
High input impedance	Very high input impedance

45. Mention the applications of UJT.

It is used in timing circuits
It is used in switching circuits
It is used in phase control circuits
It can be used as trigger device for SCR and TRIAC.
It is used in saw tooth generator.

46. Compare BJT and JFET.

BJT	JFET
Low input impedance	High input impedance
High Output impedance	Low output impedance
Bipolar device	Unipolar device
Noise is more	Less noise
Cheaper	Costlier
Gain is more	Gain is less
Current controlled device	Voltage controlled device

47. Differentiate BJT and UJT.

BJT	UJT
It has two PN junctions	It has only one PN junctions
Three terminals present are emitter, base, collector	Three terminals present are emitter, base1,base2
Basically a amplifying device	Basically a switching device
Gate surface is smaller	Gate surface is larger
It has two PN junctions	It has one junctions

48. What is meant by latching current & holding current?
Latching current is the minimum anode current required to maintain the thyristor in the on State immediately after a thyristor has been turned on and gate signal has been removed. Holding current is the minimum anode current to maintain the thyristor in the on state.

49. What is an IGBT? List its types.
Insulated gate bipolar transistor (IGBT) combines the advantages of BJT and MOSFET. Therefore it has low switching times as well as low power losses.

1. Punch through IGBT 2. Non punch IGBT.

50. What are the advantages of IGBTs?
They have low conduction loss.
They have fast switching characteristics.
They have very high operating frequency
They have high input gate impedance.

PART-B

1. (i)Explain the construction and operation of NPN transistors with neat sketch. Also comment on the characteristics of NPN transistor.

(ii) Explain the input/output characteristics of BJT in common base configuration.

(ii**i)**Explain the operation of NPN transistor in CE configuration with its input and output characteristics. Also define Active, saturation and cut-off region.

(iv) Compare the performance of a transistor in different configuration**.**

2. (i)Explain the selection of Q point for a transistor bias circuit and discuss the limitations on the output voltage swing.

(ii) Explain in detail, different biasing methods for a transistor circuit with neat circuit diagram and obtain respective stability factors.

(iii)Draw a self bias circuit using BJT and derive an expression for the stability factor.

(iv) Draw the collector to base bias circuit of a transistor and derive the expression for the stability factor.

(v) Distinguish between d.c and a.c load lines with suitable diagram.

(vi) Explain how potential divider bias is obtained.

3. (i)Explain the construction and operation of N-channel JFET with neat sketches and characteristics curve.

4. With the help of suitable diagram, explain the working of enhancement MOSFET. Draw and explain its VI Characteristics.

5. Describe the construction and working of UJT with its equivalent circuit and V-I characteristics.

6. In an transistor amplifier using voltage divider bias, the operating point is chosen such that I-q = 2rnA, VCE = 3V. If Rc=2.2Kohm, VCC = 9V, β= 50, find the values of bias resistois and RE. Assume VBE = 0.3V and current through the bias resistors is 10IB".

7. The reverse leakage current of the transistor when connected in CB configuration is 0.2 mA and it is 18 μA when the same transistor is connected in CE configuration. Determine αdc &βdc of the transistor. Assume IB =30mA.

8. (i) For an n-channel silicon FET with a=3x10-4 cm and Nd=1015 electrons/cm-3. Evaluate (a) pinch off voltage (b) the channel half width for VGS= 0.5Vp.

(ii) In biasing with feedback resistor method, a silicon transistor with feedback resistor is used. The operating point is 7V, 1mA and VCC=12V. Assume β=100. Determine the value of RB, Stability factor and the new operation point if β=50 and all other circuit values the same.

9. Design a voltage divider bias circuit for transistor to establish the quiescent point at VCE=12V, IC=1.5mA, stability factor S≤3, β = 50, VBE=0.7V, VCC=22.5V and RC=5.6kΩ (16)

10. (i)With neat sketch, explain the construction, operation and characteristics of SCR.

(ii) Explain the construction and working principles of DIAC and TRIAC with neat sketches.

(iii) With neat sketch, explain the construction, operation and characteristics of IGBT.

11. (i) Take part in discussion of the two transistor model of a thyristor in detail.

(ii) Sketch and explain the typical shape of drain characteristics of JFET for VGS=0 with indication of four region clearly.

UNIT III AMPLIFIERS

PART-A

1. What is an amplifier?
An amplifier is a circuit which can be used to increase the magnitude of the input current or voltage at the output by means of energy drawn from an external source.

2. Based on the transistor configuration how amplifiers are classified?
Based on transistor configuration, the amplifiers are classified as
Common emitter amplifier
Common base amplifier
Common collector amplifier.

3. List out the classification of large signal amplifiers.
The large signal amplifiers are classified as follows.
Based on the input
- Small signal amplifier
- Large scale amplifier

Based on the output
- Voltage amplifier
- Power amplifier
- Current amplifier

Based on the transistor configuration
- CE amplifier
- CB amplifier
- CC amplifier

Based on the number of stages
- Single stage amplifier
- Multi stage amplifier

Based on band width
- Untunned amplifier (wide band amplifier)
- Tuned amplifier (narrow band amplifier)

Based on the frequency response
- AF(Audio Frequency) amplifier
- IF (Intermidiate Frequency) amplifier
- RF(Radio Frequency) amplifier

Based on the biasing condition
- i. Class A amplifier
- ii. Class B amplifier
- iii. Class C amplifier
- iv Class AB amplifier
- v Class D amplifier
- vi Class S amplifier

4. Compare input impedance and voltage gain of CE and CC amplifiers.

Characteristics	CE	CE
Input Impedance	Low	High
Voltage Gain	Medium	Low

5. Define hybrid parameters.
Any linear circuit having input and output terminals can be analyzed by four parameters are input impedance, output impedance, current gain and voltage gain.(one measured on ohm, one in mho and two dimensionless) called hybrid or h-parameters.

6. What are the use of h - Parameters?
It perfectly isolates the input and output circuits. Its source and load currents are taken into ac-count.

7. Write the procedure to draw the a.c. equivalent of a network.
Setting all the dc sources to zero and replacing them by a short circuit equivalent.
Replacing all capacitors by a short circuit.
Removing all elements bypassed by the short circuit equivalents introduced by step 1 & step 2.
Redrawing the n/w in a more convenient & logical form.

8. What is the effect of coupling capacitors at low frequency?
At low frequency the coupling capacitors acts as open circuit**.**

9. What is the effect of coupling capacitors at high frequency?
At high frequency the coupling capacitors acts as short circuit

10. 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 gain Moderate input to output ratio.

11. Write the voltage and current equation for hybrid parameters.
$V1 = h11\ i1 + h12\ V2$
$I2 = h21\ i1 + h22\ V2$

13. What are the values of h-parameters?

$h11 = V1/ i1$
$h12 = V1 / V2$
$h21 = i2 / i1$
$h22 = i2 / V2$

14. Write the hybrid equations of CE amplifier.
$Vb = hieib + hreVc$ $Ic = hfeib + hoeVc$

15. Write short note on effects of coupling capacitor.

The coupling capacitor transmits a.c. signal but blocks d.c. This prevents d.c. interference between various stages and the shifting of operating point. It prevents the loading effect between adjacent stages.

16. Define trans-conductance with respect to a JFET .
In amplifier terminology, the gain is as known as transconductance and is denoted by the symbol of gm the gain is given by gm = ΔID / ΔVGS.

17. What is the need of coupling capacitors in amplifier design?

A coupling capacitor is a capacitor which is used to couple or link together only the AC signal from one circuit element to another. The capacitor blocks the DC signal from entering the second element and, thus, only passes the AC signal.

18. Define upper and lower cut off frequencies of an amplifier.
The frequency at which the voltage gain of the amplifier is exactly 70.7% of the maximum gain is known as lower cut off frequency. The frequency at which the voltage gain of the amplifier, is exactly 70.7% o0f the maximum gain is known as upper cutoff frequency.

19. Define the term bandwidth and gain bandwidth product.
Bandwidth is defined as the range of frequency over which the gain remains constant.
The product of midland gain and bandwidth is called gain bandwidth product.

20. What are the causes of occurrence of upper cutoff frequency in BJT?

The internal capacitors are the main element for decrease of gain as well as occurrence of upper cut off frequency.

21. List out the application and characteristics of CE amplifier.
It is used as voltage amplifier, among the three basic transistor amplifiers.
Characteristics of CE amplifier:
□□It has good voltage gain with phase inversions. i.e. the output voltage is 180°out of phase with input
□□It also has good current, power gain and relatively high input and output impedance.

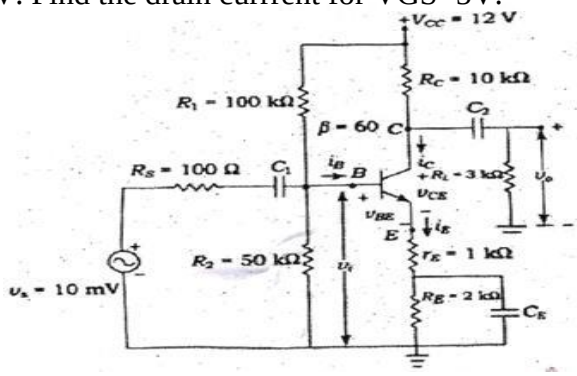
22. What is millers theorem?
Millers theorem states that the capacitor connected between the input and output can be split in to two net works such that one network appears as the mirror image of the other one.The impedance of such network can be taken by open circuiting or short circuiting the common connections exist between the two net works.

23. Define frequency response.

Frequency response can be defined as measure of output parameter variation with respect to variation of input frequency.

PART-B

1. Draw the h-parameter model of a BJT-CE amplifier and derive the equations for voltage gain, current gain, input impedance and output impedance.
2. Draw the a.c equivalent circuit of a C.B/CE amplifier using h-parameter model and derive the equation for Zi,Zo,Av and Ai.
3. Discuss the factors involved in the selection of Ic, Rc and Re for a single stage common emitter BJT amplifier circuit ,using voltage divider bias**.**
4. Compare and contrast all the parameters of CC,CB and CC amplifiers.
5. With neat circuit diagram, perform ac analysis for common source and common drain using equivalent circuit NMOSFET amplifier.
6. Describe about small signal MOSFET amplifiers (NMOS) and obtain the expression for its transconductance.
7. (i) Derive the expression for the voltage gain of CS amplifier .
(ii) For CS amplifier, the operating point is defined by VGSQ=-2.5V,Vp= -6V and IdQ=2.5mA with IDSS=8mA. Also RG=1MΩ, RS=1 KΩ, RD=2.2KΩ and VDD=15V.Calculate gm, rd, Zi, Zo and Av **.**
8. The hybrid parameters of a transistor used as an amplifier in the CE configuration are hie = 800Ω, hfe = 46, hoe = 80 x 10-6 and hre = 5.4x 10-4. If RL = 5K and Rs=500Ω. Find Ai, Ri , Av, Pi .
9. For a CB amplifier driven by voltage source of internal resistance Rs=1200Ω. The load impedance is resistor RL=1000Ω. The H parameters are Hin=22Ω Hcb=3x10-4, Hfb= -0.98 and Hinf=0.5A/V. Estimate the current gain A, Input impedance Ri, voltage gain Av, overall gain Ais, overall voltage gain Avs and output impedance Zo.
10. The figure shows a common-emitter amplifier. Determine the input resistance, ac load resistance, voltage gain and output voltage.
11. (i)Explain the working of Common emitter Amplifier.
(ii)The data sheet of an enhancement MOSFET gives ID(on) = 500 mA at VGs = 10 V and VGs TH = lV. Find the drain currrent for VGS=5V.



UNIT IV MULTISTAGE AMPLIFIERS AND DIFFERENTIAL AMPLIFIER

PART-A

1. What is a differential amplifier? What are its advantages?
An amplifier that has two inputs and produces an output signal that is a function of the difference between the two inputs. Advantages:

(i) It can compare any two signals and detect any difference. (ii).It gives higher gain than two cascaded stages of ordinary direct coupling. (iii).It provides very uniform amplification of signal from dc up to very high frequencies.

2. What are the applications of differential amplifier?
In the medial electronics field
As a input stage in the measuring instruments
In analog computation
In linear integrated circuits

3. What is the need of constant current circuit in differentia amplifier?
The necessary for constant current source for differential amplifier to increase the CMRR without changing quiescent current and without lowering the forward current gain.

4. Define CMRR.what is its ideal value?
It is defined as the ratio of the differential voltage gain (Ad) to the common mode voltage gain (Acm) . CMRR = 20 log (Ad/Acm)
For a perfect differential amplifier, the CMRR is equal to infinity as Acm is zero.

5. State the different methods of biasing of difference amplifier.
a. The different methods of biasing of difference amplifier are,
b. i) Emitter bias ii) Constant current bias

6. Distinguish between common mod signal and differential mode signal.

If the same input is applied to both the inputs, the operation is called common mode signal. It is the average value of the input signals. **Vc = (V1 +V2) / 2.**

If the two opposite polarity input signals are applied, the operation is referred to as difference mode. The difference between the input voltages in called difference mode signal.

7. Explain the difference between voltage and power amplifier.

Voltage Amplifier: The input given to the transistor is in millivolts. The transistor used is a small signal transistor. Power Amplifier: The input given to the transistor is in volts. The transistor used is a power transistor.

8. Explain why power amplifier is also known as large signal amplifier.

Since the output obtained from the power amplifier is very large, it is known as large signal amplifier.

9. How do you bias the class A amplifier? List the advantage of class A amplifiers.

In class A mode, the output current flows through the entire period of input cycle and the Q point is chosen at the midpoint of AC load line and biased. An amplifier is a circuit which can be used to increase the magnitude of the input current or voltage at the output by means of energy drawn from an external source.

Advantages of class a power amplifier.
Lower distortion
Higher suppression of ripple and noise from the power supply
Lower output impedance
Better DC stability
Suppression of interference from the loudspeaker connection

10. Which power amplifier gives minimum distortion?
Class C power amplifier gives minimum distortion.

11. Define class A power amplifier.
It is an amplifier in which the input signals and the biasing is such that the output current flows for full cycle of the input signal.

12. Define class B power amplifier.
It is an amplifier in which the input signal and the biasing is such that the output current flows for half cycle of the input signal

13. Define class C power amplifier.
It is an amplifier in which the input signal and the biasing is such that the output current flows for less than half cycle of the input signal

14. Define class AB power amplifier.
It is an amplifier in which the input signal and the biasing is such that the output Current flows for more than half cycle but less than full cycle of the input signal

15. Define class D power amplifier.
It is an amplifier which is used in digital circuits and also the input signals are pulses.

16. Give two applications of class C power amplifier.
It is used to generate pulses.
It is used to trigger other devices.

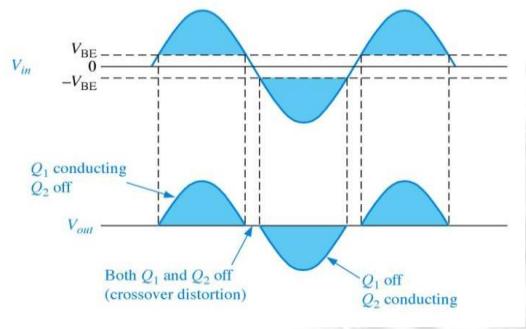
17. Write any two characteristics of class A amplifier.
The Q point is placed at the center of the DC load line.
The overall efficiency is 25%.

18. What are the features of class – C power amplifier?

The output current flows only during a part of the positive half cycle of the input signal. This condition is achieved by biasing the transistor below cut off.
The output signal does not Resemble the input Signal because it consists of narrow pulses
The class – C amplifiers is the most efficient power amplifier and its overall efficiency, under certain conditions, may approach even 100%

19. What is meant by cross over distortion?

In Class – B amplifier, both the transistors are at cut off region that is bias voltage is zero. So input signal voltage should exceed the barrier voltage to make the transistor conduct until the input signal exceeds 0.7V for Si and 0.3V for Ge, otherwise the transistor cannot conduct. So there is a time interval between the positive and the negative alterations of the input signal when neither transistor is conducting. The resulting distortion in the output signal is cross over distortion.



20. How crossover distortion is eliminated?
To avoid crossover distortion, a slight forward bias (0.3V for germanium, 0.6V for silicon) voltage is applied to the base emitter junction of the transistors. It causes transistor to conduct immediately when the input signal is applied. So Q point is fixed above the cut-off.

21. State the merits of using push pull configuration.
The merits of push pull configuration are,
Efficiency is high (78.5%)
Figure of merit is high
Distortion is less
Ripple present in the output due to power supply is multified.

22. Define conversion efficiency of a power stage.
The ratio of the AC output power delivered to the load DC input power applied is referred to as conversion efficiency. It is also called as collector circuit efficiency in case of transistor amplifier
$\eta = Signal\ power\ delivered\ to$ to the $ad/\ DC\ power\ supplied\ at\ input\ circuit\ X$ 100

23. State Bisection theorem
This is called Bisection theorem can be applied to any symmetrical network. Emitter coupled differential amplifier is symmetrical network.

24. What do you mean by tuned amplifiers?
The amplifiers which amplify only selected range of frequencies (narrow band of frequencies) with the help of tuned circuits (parallel LC circuit) are called tuned amplifiers.

25. What are the various types of tuned amplifiers?
Small signal tuned amplifiers
Single tuned amplifiers
Capacitive coupled
Inductively coupled (or) Transformer coupled
Double tuned amplifiers
Stagger tuned amplifiers
Large signal tuned amplifiers

26. Give the expressions for the resonance frequency and impedance of the tuned circuit.
$f = 1 / 2\pi\sqrt{LC}$ & $Z R = L/CR$

27. What is the response of tuned amplifiers?
The response of tuned amplifier is maximum at resonant frequency and it falls sharply for frequencies below and above the resonant frequency.

28. Define Q factor of resonant circuit.
It is the ratio of reactance to resistance.
It also can be defined as the measure of efficiency with which inductor can store the energy.
Q=2π *(Maximum Energy Stored per cycle / Energy dissipated per cycle)

29. What is dissipation factor?
It is defined as 1/Q. It can be referred to as the total loss within a component.

30. Define unloaded and loaded Q of tuned circuit.
The unloaded Q or QU is the ratio of stored energy to dissipated energy in a reactor or resonator. The loaded Q or QL of a resonator is determined by how tightly the resonator is coupled to its terminations.

31. Why quality factor is kept as high as possible in tuned circuits?
When Q is high, bandwidth is low and we get better selectivity. Hence Q is kept as high as possible in tuned circuits. When Q is high inductor losses are less.

32. List various types of cascaded Small signal tuned amplifiers.
Single tuned amplifiers.
Double tuned amplifiers.
Stagger tuned amplifiers.

33. How single tuned amplifiers are classified?
Capacitance coupled single tuned amplifier.
Transformer coupled or inductively coupled single tuned amplifier.

34. What are single tuned amplifiers?
Single tuned amplifiers use one parallel resonant circuit as the load impedance in each stage and all the tuned circuits are tuned to the same frequency.

35. What are double tuned amplifiers?
Double tuned amplifiers use two inductively coupled tuned circuits per stage, both the tuned circuits being tuned to the same frequency.

36. What are stagger tuned amplifiers?
Stagger tuned amplifiers use a number of single tuned stages in cascade, the successive tuned circuits being tuned to slightly different frequencies. (OR) It is a circuit in which two single tuned cascaded amplifiers having certain bandwidth are taken and their resonant frequencies are adjusted that they are separated by an amount equal to the bandwidth of each stage. Since resonant frequencies are displaced it is called stagger tuned amplifier.

37. What is Neutralization?
The technique used for the elimination of potential oscillations is called neutralization. (OR) The effect of collector to base capacitance of the transistor is neutralized by introducing a signal that cancels the signal coupled through collector base capacitance. This process is called neutralization.

38. What is the use of Neutralization?
BJT and FET are potentially unstable over some frequency range due to the feedback parameter present in them. If the feedback can be cancelled by an additional feedback signal that is equal in amplitude and opposite in sign, the transistor becomes unilateral from input to output the oscillations completely stop. This is achieved by Neutralization

39. What are the different types of neutralization?
i)Hazeltine neutralization
ii) Rice neutralization
iii)Neutrodyne neutralization.

40. What is rice neutralization?
It uses center tapped coil in the base circuit. The signal voltages at the end of tuned base coil are equal and out of phase.

41. Write down the need of cascading the amplifiers.
Cascading means connecting the output of one amplifier to the input of another to form a multistage amplifier. The overall gain of cascaded amplifiers depends on that of each stage and the total number of stages. The purpose of cascading amplifiers is to reach the desired signal power with a minimum amount of distortion, by providing equal overall gain characteristics to all frequencies in the signal.

PART-B

1.With neat sketch explain two stage cascaded amplifier and derive its overall Av,Ai,Ri and Ro.
2. Draw the circuit of emitter coupled BJT differential amplifier, and derive expressions for differential gain, common mode gain and CMRR.

3. What is Neutralization? Explain any one method in brief.
4. (i)Draw the circuit diagram of a push pull amplifier and explain its working in detail.
(ii) Derive the equation for efficiency of a class B power amplifier.
5. (i)Explain the operation of complementary symmetry push pull amplifiers state its advantages and disadvantages.

(ii) Explain the working of Class A Power amplifier and derive the expression for the power output, efficiency.
(iii) Explain the working of Class C Power amplifier and derive the expression for the power output, efficiency.
6. With the neat circuit, explain and derive the gain and bandwidth of a single tuned amplifier with its frequency response.
7. Draw the circuit of FET input stages, and derive expressions for differential gain, common mode gain and CMRR.
8. The dual input balanced output differential amplifier having Rs=100Ω, RC=4.7KΩ, RE =6.8KΩ,hfe=100,VCC=+15V, VEE=-15V. Find operating point values, differential &common mode gain, CMRR and output if Vs1=70mV(p-p) at 1 kHz and Vs2=40mV(p-p) .
9. A Class C amplifier with VCC=25V has RL=680Ω,Cp=4300pF,Lp=20μH and Rw=0.06Ω.The transistor has VCE(sat)=0.6V.Calculate the appropriate signal frequency, the output power and circuit efficiency.
10. The differential amplifier has the following values RC = 50 K, Re = 100K and Rs = 10K. The transistor parameters are rπ = 50K= hie, hfe = Vo = 2 x10^3, ro=400K.Determine Ad, Ac and CMRR in db.
11. Construct BiMOS cascade amplifier.
12. Explain the different types of neutralization technique used in tuning amplifier.
13. Interpret the qualitative analysis for power amplifiers.

UNIT V FEEDBACK AMPLIFIERS AND OSCILLATORS

PART-A

1. Define positive feedback.

If the feedback signal is in phase with input signal, then the net effect of the feedback will increase the input signal given to the amplifier. This type of feedback is said to be positive or regenerative feedback.

2. Define negative feedback.

If the feedback signal is out of phase with the input signal then the input voltage applied to the basic amplifier is decreased and correspondingly the output is decreased. This type of feedback is known as negative or degenerative feedback.

3. Define sensitivity.

Sensitivity is defined as the ratio of percentage change in voltage gain with feedback to the percentage change in voltage gain without feedback.

4. Define Desensitivity (D).

Desensitivity is defined as the reciprocal of sensitivity. It indicates the factor by which the voltage gain has been reduced due to feedback network.

Desensitivity factor (D) = 1+A β.

Where A = Amplifier gain. β = Feedback factor.

5. What are the types of feedback?

i. Voltage-series feedback
ii. Voltage-shunt feedback
iii. Current-series feedback
iv. Current-shunt feedback

6. Define feedback?

A portion of the output signal is taken from the output of the amplifier and is combined with the normal input signal. This is known as feedback.

7. Give an example for voltage-series feedback.

The Common collector or Emitter follower amplifier is an example for voltage series feedback.

8. Give the properties of negative feedback.

i. Negative feedback reduces the gain
ii. Distortion is very much reduced

9. Distinguish between series and shunt feedback.

Series Feedback	**Shunt Feedback**
In series feedback amplifier, the feedback signal is connected in series with the input signal.	In shunt feedback amplifiers, the feedback signal is connected in parallel with the input signal.
It increases the input resistance	It decreases the input resistance.

10. Give the effect of negative feedback on amplifier characteristics.

Type of feedback	**Voltage gain**	**Bandwidth**	**Input resistance**	**Output resistance**
Current-series	Decreases	Increases	Increases	Increases
Voltage-series	Decreases	Increases	Increases	Decreases
Voltage-shunt	Decreases	Increases	Increases	Decreases
Current-shunt	Decreases	Increases	Increases	Increases

11. What are the drawbacks of negative feedback?

There are two disadvantages of negative feedback (i)the overall gain is reduced almost in direct proportion to the benefits, and it is often necessary to compensate for the decrease in gain by add-

ing an extra amplifier stage;(ii)the circuit may tend to oscillate, in which case careful design is required to overcome this problem. Negative feedback is also known as degenerative feedback because it degenerates (or reduces)the output signal.

12. What are the advantages of negative feedback?

- Gain stability
- Noise reduction
- Reduction in nonlinear distortion
- Bandwidth can be increased
- Increase in input impedence
- Decrease in output impedence

13. What is Oscillator circuit?

A circuit with an active device is used to produce an alternating current is called an oscillator circuit.

14. What are the classifications of Oscillators?

*Based on wave generated:

i. Sinusoidal Oscillator,
ii. Non-sinusoidal Oscillator or Relaxation Oscillator
Ex: Square wave, Triangular wave, Rectangular wave etc.

*According to principle involved:

i. Negative resistance Oscillator
ii. Feedback Oscillator.

*According to frequency generated:

i. Audio frequency oscillator 20 Hz – 20 kHz
ii. Radio frequency Oscillator 30 kHz – 30 MHz
iii. Ultrahigh frequency Oscillator 30 MHz – 3 GHz
iv. Microwave Oscillator 3GHz – above.

* Crystal Oscillators.

15. What are the types of feedback oscillators?

* RC-Phase shift Oscillator,
* LC-Oscillators
i. Tuned collector Oscillator
ii. Tuned emitter Oscillator
iii. Tuned collector base Oscillator
iv. Hartley Oscillator
v. Colpits Oscillator
vi. Clap Oscillator

16. Define Barkhausen Criterion.

Condition for sustained oscillation,
a. Magnitude condition $|Av\beta| = 1$
b. Phase condition angle $Av\beta = 0°$
These conditions are called as Barkhausen criterion.

17. Write the expression for gain and oscillation frequency for wein bridge oscillator.
Oscillating frequency, and gain, $f= 1 / 2\Pi RC$ and gain $\beta=1/3$

29. Define piezoelectric effect.
When applying mechanical energy to some type of crystals called piezoelectric crystals the mechanical energy is converted into electrical energy is called piezoelectric effect.
$F \alpha 1/T$.

18. What is Miller crystal oscillator? Explain its operation.
It is nothing but a Hartley oscillator its feedback Network is replaced by a crystal. Crystal normally generate higher frequency reactance due to the miller capacitance are in effect between the transistor terminal.

19.Name two high frequency oscillators.
(i) Hartley oscillator (ii) Colpitts oscillator

20. What are the advantages of crystal oscillator?
Simple circuit since no tuned circuit is needed other than the crystal it self. Different frequencies of oscillations can be obtained by simply replacing one crystal by another. Hence it makes it easy for a radio transistor to work at different frequencies. Since the frequency of oscillation is set by the crystal, changes in the supply and transistor parameters does not affect the frequency of oscillation.

21. Mention the types of feedback amplifiers.
i) Voltage Series ii) Voltage Shunt iii) Current Series iv) Current Shunt

22. What is the advantage of colpitts oscillator compared to phase shift oscillator?
Colpitts oscillator Advantages: a) Simple construction. b) It is possible to obtain oscillations at very high frequencies. Disadvantages: a) It is difficult to adjust the feedback as it demands change in capacitor values. b) Poor frequency stability. Application: a) As a high frequency generator Advantages of RC phase shift oscillator. a) Simplicity of the circuit. b) Useful for frequencies in the audio range. c) A sine wave output can be obtained. Disadvantages of RC phase shift oscillator. a) Poor frequency stability. b) It is difficult to get a variable frequency output, because to change the frequency, we need to vary all the resistors and capacitors simultaneously which is practically very difficult.

23. Differentiate oscillator and amplifier.
Oscillator producuce an alternating current
Amplifier will provide a stable output which is an amplified version of input signal.

PART-B

1. i) Explain in detail the advantages of negative feedback.
ii) Explain with circuit diagram, a negative feedback amplifier and obtain expression for its closed loop gain.
2. Determine Rif,Rof,Av and Avf for the Voltage shunt feedback amplifier.
3. Determine Rif,Rof,Av and Avf for the Voltage series feedback amplifier.
4. Sketch the circuit diagram of a two-stage capacitor coupled BJT amplifier that uses series voltage negative feedback. Briefly explain how the feedback operates.

5. Draw circuit of CE amplifier with current series feedback and obtain the expression for feedback ratio, voltage gain, input and output resistances.
6. Discuss in detail the characteristics of current shunt feedback amplifier.
7. Explain the following with neat diagram.
(i) RC phase shift oscillator
(ii) Hartley oscillator
(iii) Colpitts oscillator
(iv) Wein bridge oscillator
(v) Crystal oscillator
8. Take part in the discussion of the four types of topology for feedback of an amplifier. Derive the expression for gain with feedback. Mention the advantages of negative feedback amplifier.
9. A Hartley oscillator is designed with L1 = 2mH, L2 = 20μH and a variable capacitance. Find the range of capacitance value if the frequency of oscillation is varied between 950 to 2050 KHZ .
10. Two identical amplifier stages , each with voltage gain of 20dB and B.W of 25kHz are cascaded. To improve gain stability the cascade is provided with negative feedback to the extent of 10%. Estimate the effective gain and bandwidth.
11. Design a Colpitts oscillator with C1 = 100pf and C2 = 7500pf. The inductance is variable. Determine the range of inductance values, if the frequency of oscillation is to vary between 950 KHz and 2050 KHz.
12. When negative voltage feedback is applied to an amplifier of gain 100, the overall gain falls to 50. Find the fraction of the output voltage feedback. If this fraction is maintained, find the value ofthe amplifier gain required if the overall stage gain is to be 75.
13. A 1 mH inductor is available. Choose the capacitor values in a colpitts oscillator so that f = l MHz and feedback fraction is 0.28.
14. When a portion of the output signal is fed to input, as you are aware, feedback is generated. Distinguish between negative feedback and positive feedback and elaborate on their individual advantages. How different parameters of an amplifier (say) will be affected by these two types of feedback ?