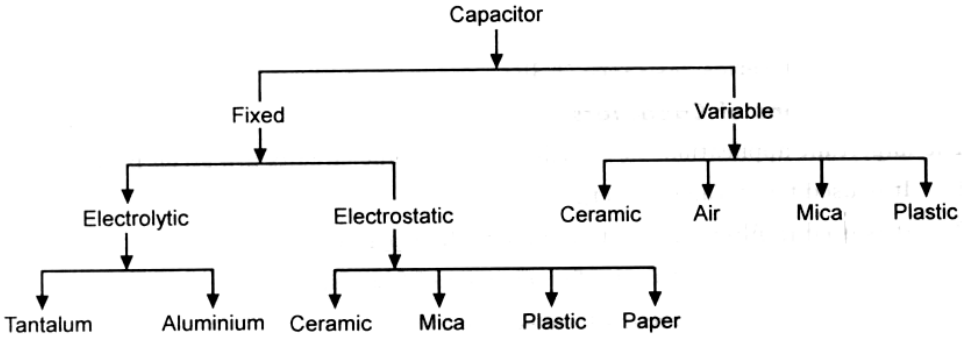
Q.1 Attempt any TEN of the following : **[20]**

Q.1(a) Give the classification of capacitor. State the unit of capacitor. **[2]**

(A)



The unit of capacitor is Farad (F)

Q.1(b) Give the applications of zener diode. **[2]**

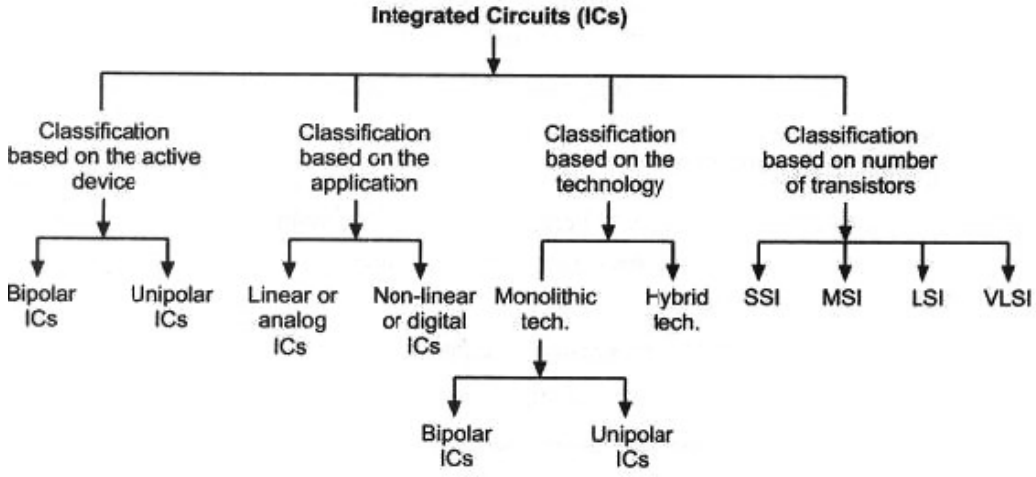
(A) Applications

(i) Voltage regulator
(ii) Reference voltage generator
(iii) Waveshaping networks
(iv) Mosfet Protection Device

Q.1(c) Give the classification of integrated circuits. **[2]**

(A)

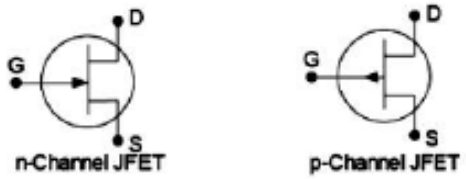
The classification of ICs is as under :



Q.1(d) State the types of JFET. Draw their symbol. **[2]**

(A) There are two types of JFET

(i) N-Channel JFET
(ii) P–Channel JFET



Q.1(e) State the two advantages and disadvantages of Integrated circuits. **[2]**

(A) Advantages of IC's are :

(i) The physical size of an IC is extremely small (generally thousand times smaller) than that of discrete circuits.
(ii) The weight of an IC is very less as compared to that of equivalent discrete circuits.
(iii) The reduction in power consumption is achieved due to extremely small size of IC.
(iv) Interconnection errors are non-existent in practice.
(v) Temperature differences between components of a circuit are small.
(vi) Close matching of components and temperature coefficients is possible.
(vii) In case of circuit failure, it is very easy to replace an IC by a new one.
(viii) Active devices can be generously used as they are cheaper than passive components.

Disadvantages of IC's are :

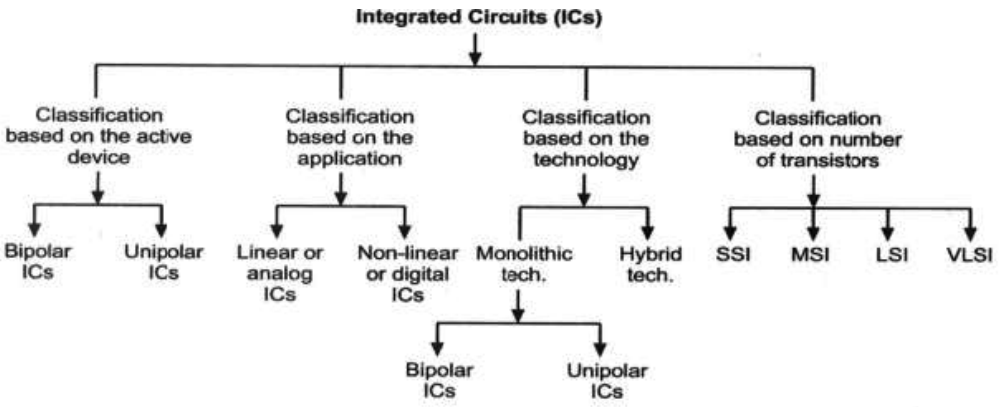
(i) It is not possible to directly fabricate inductors.
(ii) The initial cost to be incurred is high.
(iii) Power dissipation is limited.
(iv) ICs are very delicate and need extra care while handling.

Q.1(f) State any four applications of BJT. **[2]**

(A) (i) Amplifiers
(ii) Switching
(iii) Oscillators
(iv) Waveshapping circuits
(v) Radio Transmitter and receivers
(vi) Output amplifiers

Q.1(g) Give the classification of ICs. **[2]**

(A)



Classification of integrated circuits (ICs)

Q.1(h) What is need for coupling? **[2]**

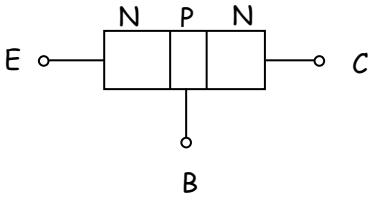
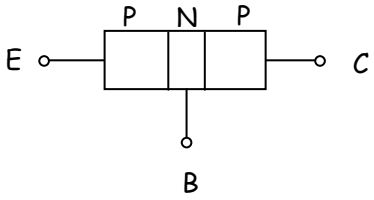
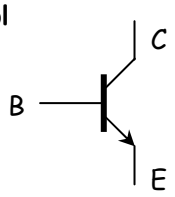
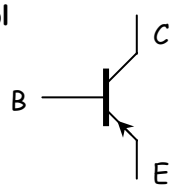
(A) Function of coupling

If, it does, the biasing conditions of the next stage are disturbed, then this type of coupling is called interstage coupling. It serves the following two purposes :

(i) It transfers the AC output of one stage to the input of the next stage.
(ii) It isolates the DC conditions of one stage to the next stage. It is necessary to prevent the shifting of Q-points.

Q.1(i) Compare NPN and PNP transistor. **[2]**

(A) Comparison between NPN and PNP transistor

	NPN Transistor	PNP Transistor
(i)	P-type material is sandwitched between two N-type materials.	N-type material is sandwitched between two P-type materials.
(ii)		
(iii)	**Symbol** 	**Symbol** 
(iv)	Majority charge carriers are electrons.	Majority charge carriers are holes.
(v)	NPN transisters are more preffered.	Less preffered as compare to NPN transistor.

Q.1(j) List the different types of MOSFET and draw their symbols. **[2]**

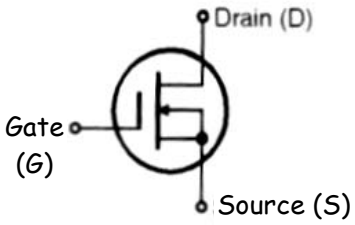
(A) Different types of MOSFET and its Symbol

MOSFET is the short form of metal oxide semiconductor field effect transistor. MOSFET are different from JFETS in construction and they are of two types:

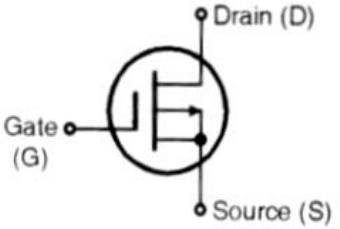
(i) Depletion type MOSFET

(ii) Enhancement type MOSFET

The symbols of both n and p–channel depletion type MOSFETs are as shown in figure 1(a) and 1(b). The substrate is connected internally to the source terminal.



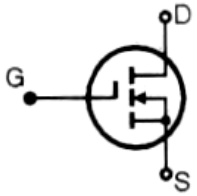
(a) Symbol of n–channel depletion type MOSFET



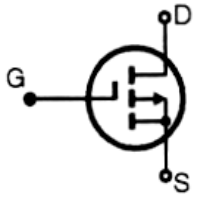
(b) Symbol of p–channel depletion type MOSFET

Fig. 1

- The circuit symbols of p and n–channel enhancement MOSFETs are as shown in figure 2.
- The substrate is internally connected to the source terminal making it a three terminal device.



n – channel



p – channel

Fig. 2 : Circuit symbols of enhancement type MOSFETs

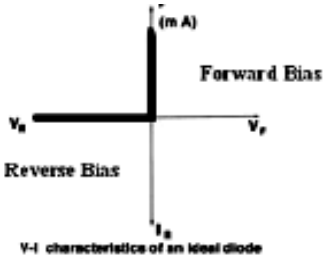
Q.1(k) List advantage of IC. **[2]**

(A) Advantage of IC

(i) The physical size of an IC is extremely (generally thousand times smaller) than that of discrete circuits.
(ii) The weight of an IC is very less as compared to that of equivalent discrete circuits.
(iii) The reduction in power consumption is achieved due to extremely small size of IC.
(iv) Interconnection errors are non-existent in practice.
(v) Temperature differences between components of a circuit are small.
(vi) Close matching of components and temperature coefficients is possible.
(vii) In case of circuit failure, it is very easy to replace an IC by a new one.
(viii) Active devices can be generously used as they are cheaper than passive components.

Q.1(l) Draw V-I characteristic of PN junction diode. **[2]**

(A)

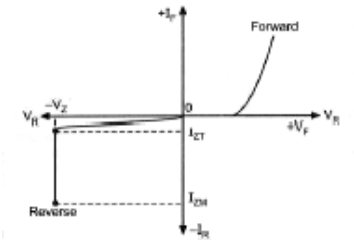


V-I characteristics of an ideal diode

Q.2 Attempt any FOUR of the following : **[16]**

Q.2(a) Draw and explain V-I characteristics of zener diode. **[4]**

(A)

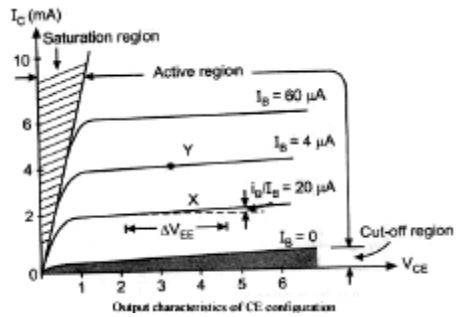


The characteristics are similar to that of an ordinary silicon PN junction diode.

- It indicates that the forward current is very small for voltages below knee voltage and large for voltages above knee (i.e. cut in) voltage.
- The reverse characteristics curve indicates that negligible reverse saturation current flows until we reach the breakdown (i.e. Zener) voltage Vz .
- The breakdown has a very sharp knee, followed by an almost vertical increase in reverse current.
- The voltage across the zener diode is approximately constant and equal to Zener voltage VZ over most of the zener breakdown region.
- It will come out of the breakdown region, when the applied reverse voltage is reduced below the Zener breakdown voltage.

Q.2(b) Draw the output characteristics of CE configuration of BJT and show all three regions. **[4]**

(A)



Output characteristics of CE configuration

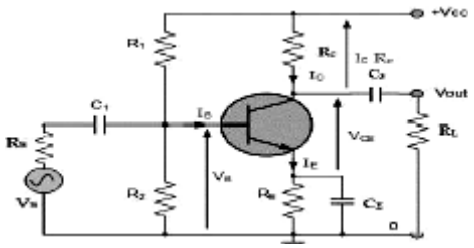
Q.2(c) List the four specifications of p-n junction diode. **[4]**

(A) The specifications of PN Junction Diode are:

(i) Maximum reverse voltage (V)
(ii) Repetitive peak voltage (V)
(iii) Maximum forward current (mA)
(iv) Power dissipation
(v) Repetitive peak forward current.
(vi) Average forward current (A)
(vii)Surge current (A)
(viii)Operating ambient temperature (0C)
(ix) Maximum junction temperature (0C)
(x) Forward voltage (V)

Q.2(d) Write the function of each component used in single stage CE amplifier. **[4]**

(A)

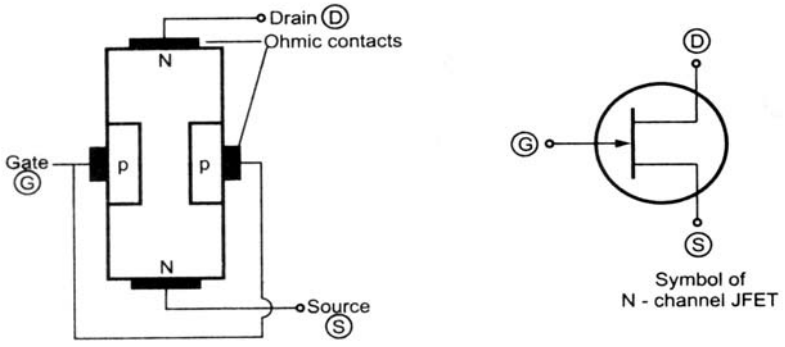


Circuit diagram : The capacitors C1 and C2 are called as coupling capacitors. A coupling capacitor passes ac signal from one side to the other and blocks DC. The capacitor C1 blocks DC from the input signal Vs. The capacitor C2 blocks DC from the output of the transistor. These capacitors are used to couple or cascade further stages of amplifier if required. The capacitor CE is called bypass capacitor. It bypasses all ac current from emitter to ground. If this capacitor is not connected, the ac voltage developed across RE will affect the input ac voltage. Such a feedback of ac signal is reduced by putting capacitor CE so that gain is not reduced. RL represents the resistance connected at the output as load. Resistor RE provides stabilization to the transistor. Resistors R1 and R2 are used for proper biasing of the transistor.

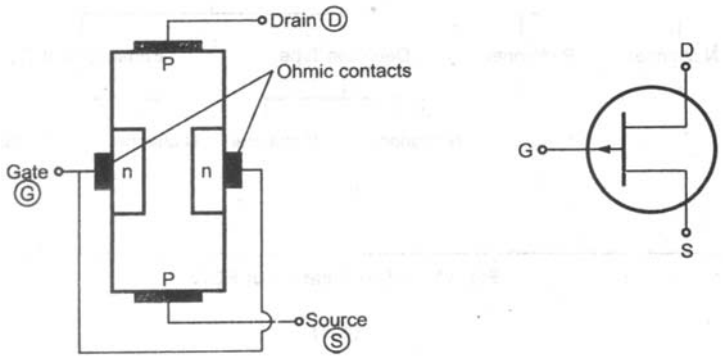
Q.2(e) Draw the construction of N-channel FET and describe it. **[4]**

(A) Construction of JFET :

The figure shows structure and symbol of n–channel JFET.



(a) Structure and symbol for n–channel JFET

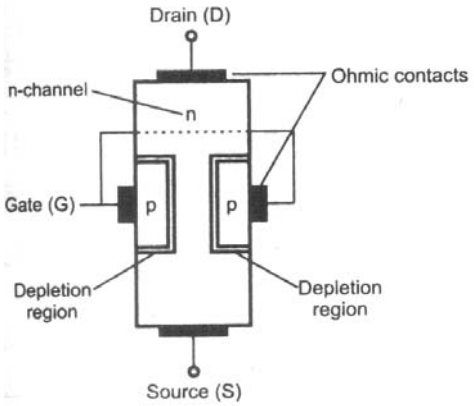


(b) Structure and symbol for P–channel

A small bar of extrinsic semiconductor material, N type (it can be of P type also) is taken and at its two ends, two ohmic contacts are made which are the drain and source terminals of FET. Heavily doped electrodes of P type material form p–n junctions on each side or the bar. The thin region between the two p gates is called the channel. Since this channel is in the n type bar, the FET is known as N–channel JFET.

The electrons enter the channel through the terminal called source and leave through the terminal called drain. The terminals taken out from heavily doped electrodes of p type material are called gates. Usually, these electrodes are connected together and only one terminal is taken out, which is called gate, as shown in the figure. The device could be made of p-type bar with two n type gates as shown in the figure (b). Then this will be p–channel JFET. The principle of working of these two types of is similar; the only difference being that in n–channel JFET the current is carried by electrons while in P–channel JFET, it is carried by holes.

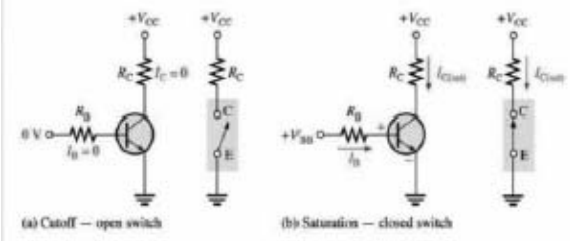
In the absence of any applied voltage, JFET has gate channel junctions under no bias conditions. The result is a depletion region at each junction, as shown in figure (c). This represents same depletion region of a diode under no bias conditions. Recall also that depletion region is that region which does not have any free carriers and therefore is unable to support conduction through the region. In JFET, the p–n junction between gate and source is always kept in reverse biased conditions. Since the current in a reverse biased p–n junction is extremely small, practically zero; the gate current in JFET is often neglected and assumed to be zero.



(c) Junction field effect transistor

Q.2(f) Explain "How transistor work as switch". [4]

(A) The transistor is act as a switch meaning that we operate it at either saturation or cut-off but not in active. When transistor is saturated, it is like closed switch from C to E and when transistor is cut-off it is like open switch. When there is negative voltage BE and CB both are reverse biased. When transistor is OFF ,no current exist in the circuit output voltage is equal to Vcc.



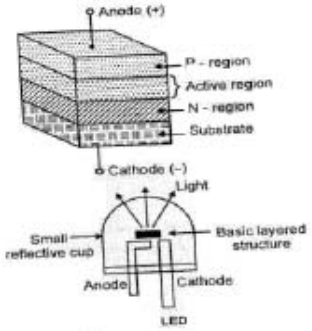
When the input voltage is positive both BE and CB junction are forward bias, therefore transistor is ON. Current Ic increases and the output voltage decreases.

So when input is low output is high and when input is high ouput is low so transistor switch is also known as inverter.

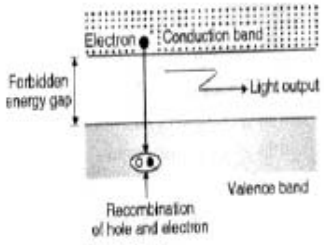
Q.3 Attempt any FOUR of the following : [16]

Q.3(a) Describe construction and working of LED. [4]

(A)



Construction Diagram



Working Diagram

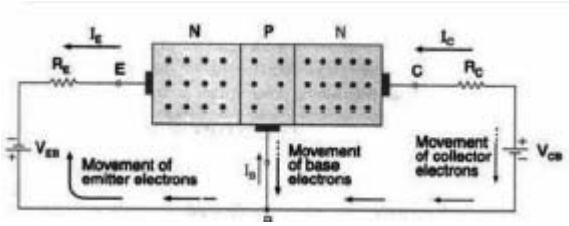
Working

When the junction is forward–biased the election in the n-region combines with the holes.

- These free electrons reside in the conduction band and at the higher energy level from the holes in the valence band. When the recombination takes place, these electrons return back to the valence band which is at a lower energy level than the conduction band.
- While returning back, the recombining electrons give away the excess energy in the form of light.

Q.3(b) Draw and explain construction of NPN transistor. [4]

(A)



Working principle : Above figure shows NPN transistor with forward biased emitter-base junction and reverse biased collector-base junction. The forward bias causes the electrons in the N-type emitter to flow towards the base. This constitutes the emitter current IE. As these electrons flow through the p-type they tend to combined with holes. As the base is likely doped and very thin therefore only a few electrons (2%) combine with holes to constitute base current IB. The remaining electrons (98%) cross over in to the collector region to constitute collector current IC. In this way almost the entire emitter current flows in the collector circuit. It is clear that emitter current is sum of collector and base current.

IE = IB + IC

Q.3(c) Define alpha and beta of a transistor and give the relation between them. [4]

(A) Current amplification Factor(alpha)

The ratio of change in collector current Ic to the change in emitter current IE at constant collector to base voltage(VCB) is known as current amplification factor.

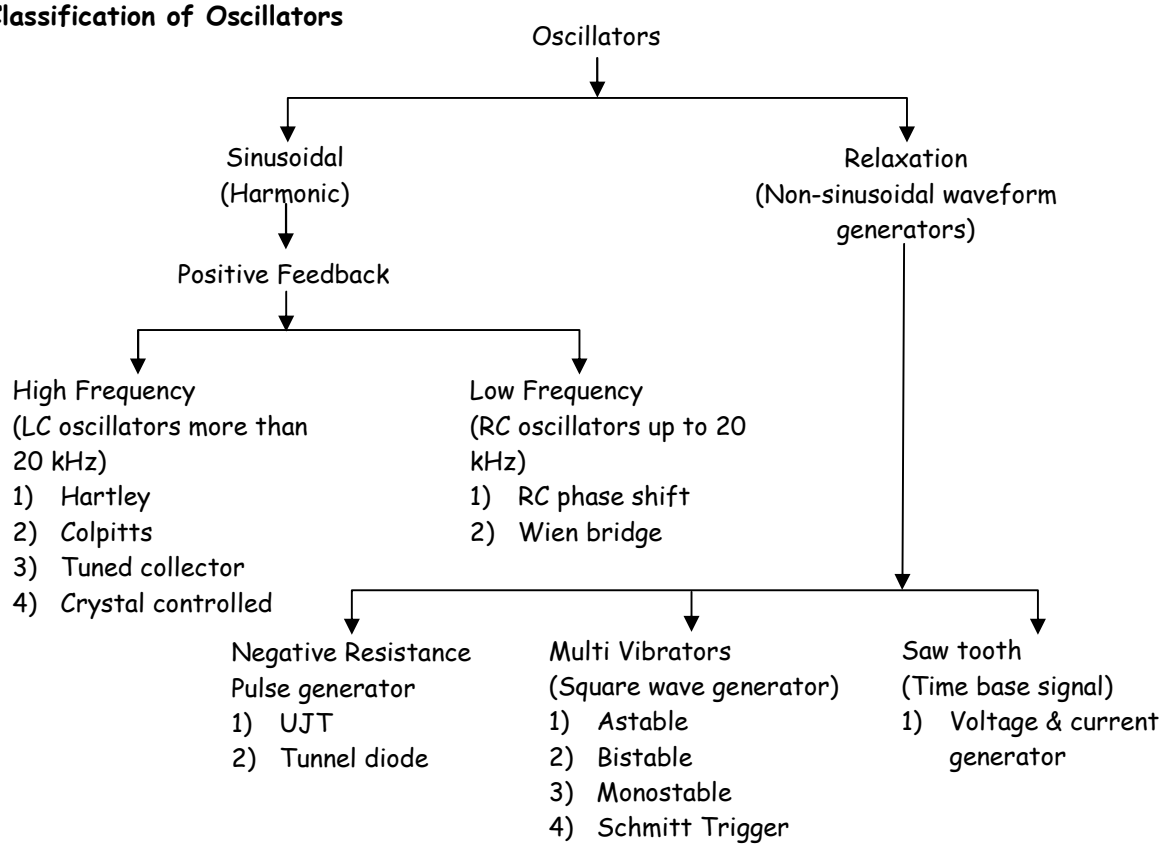
Amplification Factor(beta)

The ratio of change in collector current to the change in base current at constant collector to emitter voltage is called as amplification factor Beta

$\beta = \alpha \div (1 - \alpha)$

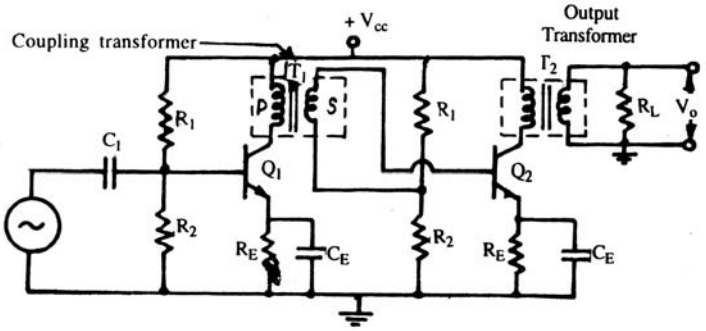
Q.3(d) Give the complete classification of oscillators. **[4]**

(A) Classification of Oscillators



Q.3(e) Draw the neat circuit diagram of two stage Transformer coupled amplifier. **[4]**

(A) Two Stage Transformer Coupled (TC) CE Amplifier



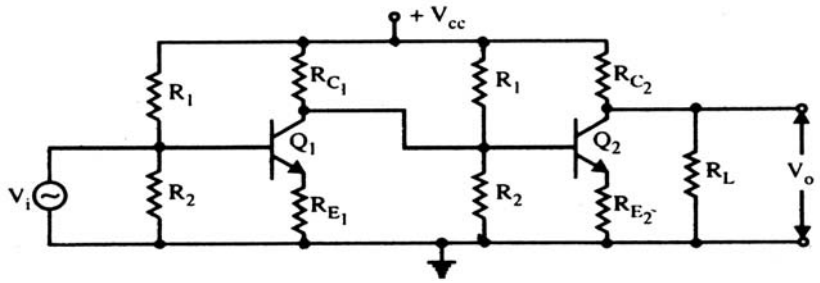
Two stage transformer coupled CE amplifier

Applications :

The applications of a transformer amplifier are as follows :

i) It is mostly used for impedance matching between the individual stages.
ii) It is widely used as a voltage amplifier in the final stage of multistage amplifier.
iii) It is widely used for amplification of radio-frequency (RF) signal.
iv) It is used to transfer power to the low impedance load such as loudspeaker.

Two Stage Direct Coupled (DC) CE Amplifier :



Two stage direct coupled CE amplifier

Applications :

The applications of direct coupled amplifier are as follows :

i) It is used is analog computation.
ii) It is used in power supply voltage regulators.
iii) It is used for bioelectric measurements.
iv) It is used in linear integrated circuits.

Q.3(f) Explain working of crystal oscillator. **[4]**

(A) **Introduction :**

- The crystals are either naturally occurring or synthetically manufactured, exhibiting the piezoelectric effect.
- The piezoelectric effect means under the influence of the mechanical pressure, the voltage gets generated across the opposite faces of the crystal.
- The main substances exhibiting the piezoelectric effect are quartz, Rochelle salt and tourmaline.

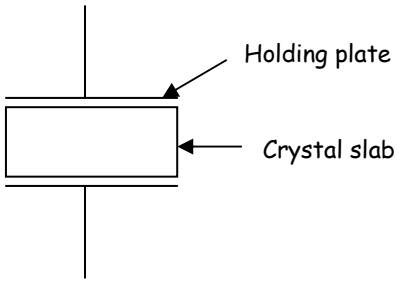


Fig. : Symbolic representation of a crystal

- The symbolic representation of such a practical crystal is shown above. The metal plates are called holding plates as they hold the crystal slab in between them.

Working principle :

Crystal oscillator work on the principle of peizo-electric effect.

When the crystal is subjected to proper alternating potential, it vibrates mechanically. The amplitude of mechanical vibration is maximum when the frequency of alternating voltage is equal to the natural frequency of vibrations of the crystal.

Equivalent circuit of the crystal :

When electric potential is applied to the crystal, then it vibrates mechanically, hence electrical equivalent of the crystal can be represented by :

L_s → Electrical equivalent of mass of crystal
C_s → elasticity of crystal
C_p → Electrostatic capacitance due to mounting electrodes, wiring & lead capacitance
R → Electrical equivalent of mechanical friction

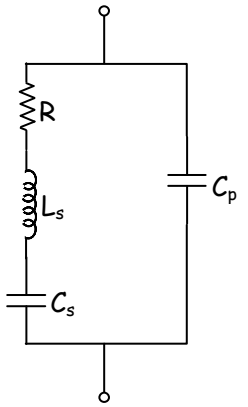


Fig. : Equivalent circuit of the crystal

The frequency of oscillation of crystal is given as

$$f = \frac{1}{2\pi\sqrt{L_s C_s}}$$

Circuit Diagram :

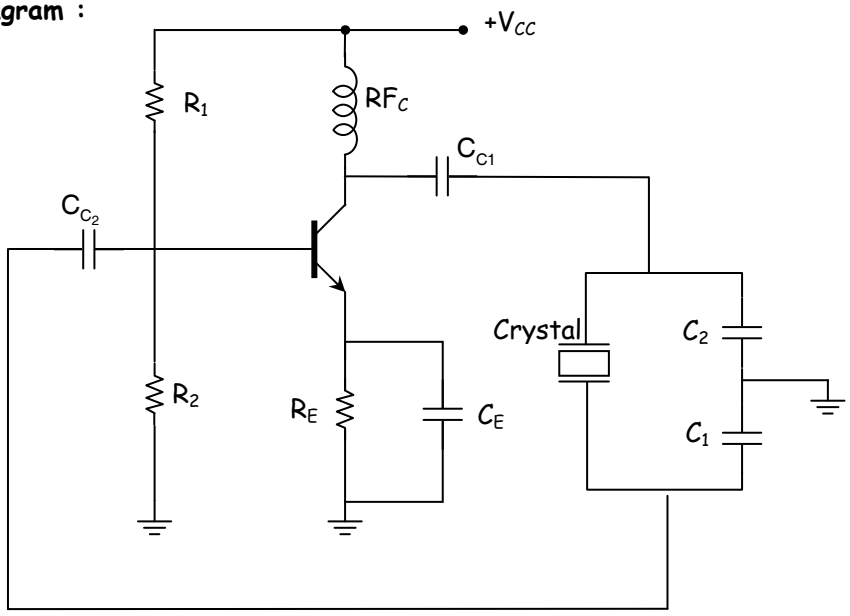


Fig. : Crystal Oscillator

- The resistances R_1, R_2, R_E provides d.c. bias while the capacitor C_E is emitter bypass capacitor.
- RFC provides isolation between a.c. and d.c. operation C_{C_1} and C_{C_2} are coupling capacitors.

Advantages :

As the frequency stability is very high at high frequency. It is used to generate very high stable frequencies.

Disadvantages :

The frequency of oscillation is inversely proportional to thickness hence to obtain very high frequencies a very low value of thickness is required which makes crystal fragile.

Applications :

There are various type of crystal oscillators available like frequency stability range of crystal oscillators, voltage controlled crystal oscillators, crystal temperature compensated crystal etc.

Above mentioned oscillators are used in base stations for mobile phones, optical transmission systems, measuring equipment etc.

Q.4 Attempt any FOUR of the following : [16]

Q.4(a) Compare JFET and BJT. [4]

(A)

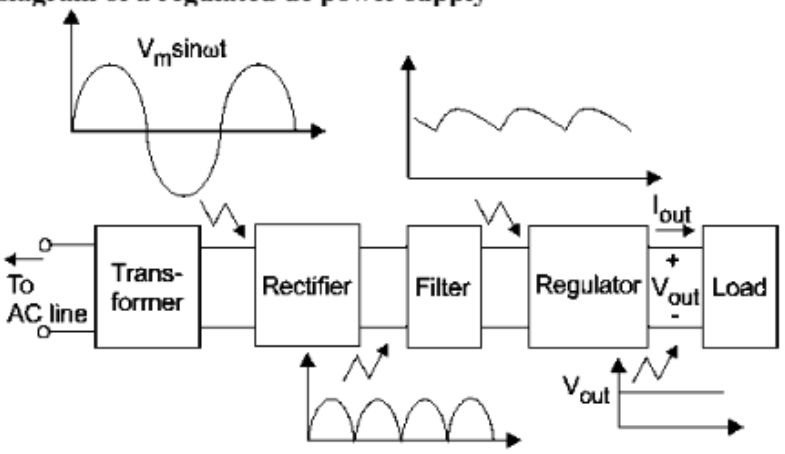
Sr. No.	JFET	BJT
(i)	It is unipolar device i.e. current in the device is carried either by electrons or holes.	It is bipolar device i.e. current in the device is carried either by both electrons & holes.
(ii)	It is a voltage controlled device i.e. voltage at the gate (or drain) terminal controls amount of current flowing through the device.	It is a current controlled device i.e. the base current controls the amount of collector current.
(iii)	Its input resistance is very high and is of order of several megaohms.	Its input resistance is very low compared to FET.
(iv)	It has a negative temperature co-efficient at high current levels. It means that current decreases as temperature increases.	It has a positive temperature co-efficient at high current levels. It means that current increases as temperature increases.

(v)	It is less noisy.	It is comparatively more noisy.
(vi)	It has relatively lower gain bandwidth product as compared to	It has relatively higher gain bandwidth product as compared to FET.
(vii)	It is simpler to fabricate as IC and occupies less space on chip compared to BJT.	It is comparatively difficult to fabricate on IC and occupies more space on chip compared to FET.
(viii)	It does not suffer from minority-carrier storage effects and therefore has higher switching speeds and cut-off frequencies.	It suffers from minority-carrier storage effects and therefore has lower switching speeds and cut-off frequencies.

Q.4(b) Draw a block diagram of regulated power supply. State the need of each block. [4]

(A)

Functional block diagram of a regulated dc power supply



Functions of each block:

Step Down Transformer : A step down transformer will step down the voltage from the ac mains to the required voltage level. The output of the transformer is given as an input to the rectifier circuit.

Rectification : Rectifier converts an alternating voltage or current into corresponding pulsating dc. Usually a full wave rectifier or a bridge rectifier is used to rectify both the half cycles of the ac supply.

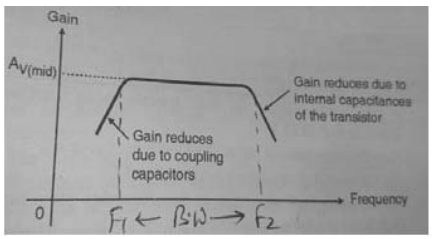
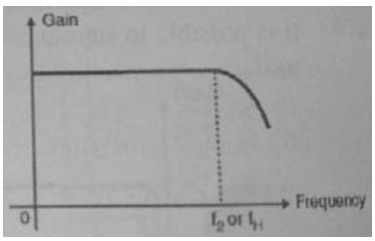
DC Filter : The rectified voltage from the rectifier is a pulsating dc voltage having very high ripple content. Hence a filter is used. Different types of filters are used such as capacitor filter, LC filter, Choke input filter, π type filter.

Regulator : The output voltage or current will change or fluctuate when there is change in the input from ac mains or due to change in load current at the output of the regulated power supply or due to other factors like temperature changes. This problem can be eliminated by using a regulator. A regulator will maintain the output constant even when changes at the input or any toher changes occur.

Q.4(c) State the need of multistage amplifier. Compare RC and direct coupled amplifiers with its frequency response and applications. [4]

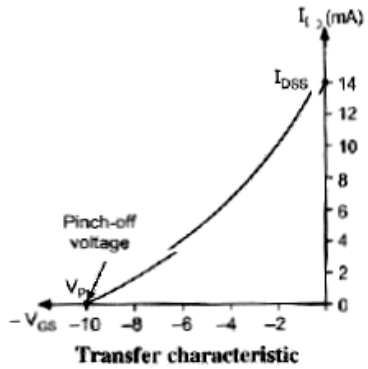
(A) Need for multistage amplifiers

- Gain should be sufficiently high.
- Input impedance should match with the source impedance.
- Output impedance should match with the load resistance.
- Bandwidth should be large.

Frequency	RC couple amplifier	Direct couple amplifiers
Response		
Application	(i) In public address (P.A.) amplifier system (ii) Tape recorders (iii) TV, VCR and CD player (iv) Stereo amplifiers	(i) n the operational (ii) amlifiers (iii) n the analog computation n the linear power supplies.

Q.4(d) Draw the transfer characteristic of n-channel J-FET and give the meaning of I_{dss} and V_{GS} off. **[4]**

(A) **I_{dss} (Shorted Gate Drain Current):** It is the drain current with source shorted to gate, i.e. Vgs = 0 and drain voltage is equal to pinch off voltage. Vgsoff: The gate to source voltage at which drain current is reduced to zero is called as pinch Off voltage or Vgs off.



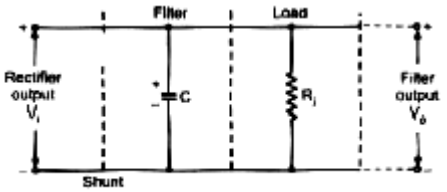
Transfer characteristic

Q.4(e) State the need of filter and explain 'C' type filter with diagrams and waveforms. **[4]**

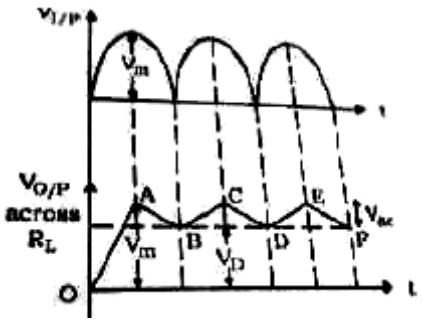
(A) **Need :** The rectifiers provide a pulsating output DC voltage across the load containing some ripple and hence these circuits do not provide ripple free (i.e. pure or steady) DC voltage.

The presence of ripple (i.e. AC component) is most undesirable in many electronic circuits and systems because it may affect their normal operation. So ripple must be kept away from the load and it should be removed from the rectified (i.e. pulsating) output.

Therefore, there is a necessity of filter circuit for removing, i.e., smoothing or filtering the ripple and allowing the (pure or steady) DC voltage to reach the load.

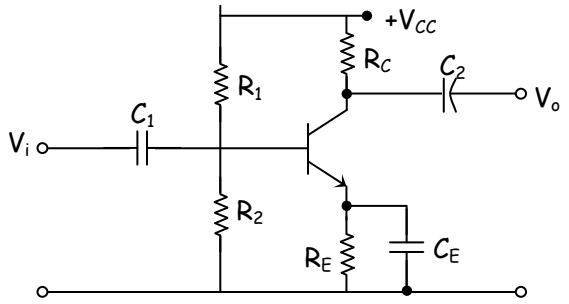


Shunt capacitor filter



Q.4(f) Draw the circuit diagram of single stage CE amplifier. Give function of each components. **[4]**

(A) Common emitter (CE) amplifier:



Single stage RC coupled RE amplifier.

- The capacitance C_1 and C_2 are called as the coupling capacitors as the load resistor R_2 is coupled to the amplifier through the coupling capacitor this amplifier is called as RC coupled amplifier.
- Resistors R_1, R_2 and R_E are used for biasing the transistor in the active region, because for operating the transistor as an amplifier it is necessary to bias it in the active region. The type of biasing used here is voltage divider bias or self bias.
- R_C is the collector resistor used for controlling the collector current.

Role of coupling Capacitor C_1 : The input coupling capacitors C_1 is used for coupling the ac input voltage V_i to the base of the transistor.

As capacitors block dc, this capacitor help to block any dc component present in Vi and couples only the ac component of the input signal. This capacitor also ensures that the dc biasing conductions of the transistor remain unchanged ever after applications of the input signal.

Role of C_E : This capacitor is connected in parallel with the emitter resistor R_E is called as emitter bypass capacitor. This capacitor offers a low reactance to the amplified ac signal. Therefore the emitter resistor R_E gets bypassed through C_E for only the ac signals. This will increase the voltage gain of the amplifier moreover as C_E act as an open circuit for d voltages it does not bypass R_E for dc conditions.

Role of C_2: This capacitor couples the amplifier output to the load resistance or to the next stage of the amplifier. It is used for blocking the dc part and passing only the ac part of the amplified signal to the load.

Q.5 Attempt any FOUR of the following : **[16]**

Q.5(a) Define the following for P-N junction diode. **[4]**

(i) Knee voltage
(ii) Peak inverse voltage
(iii) Reverse saturation current
(iv) Maximum forward current

(A) (i) Knee voltage

- The applied forward voltage at which the PN junctions starts conducting is called the cut in (Vr) voltage. it is also known as knee voltage (Vk or Vz)
- The value of cut-in voltage is 0.6 V for Silicon and 0.2 V for Germanium PN junction diodes.

(ii) Peak inverse voltage

- The maximum value of reverse voltage that a diode can withstand withstand without destroying its PN junction ruing the non-conduction period is called peak inverse voltage.
- The diode should be so chosen as to withstand this reverse voltage.

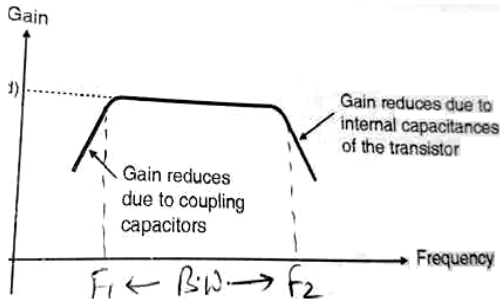
(iii) Reverse saturation current : In reverse bias condition there will be negligible amount of current that will flow through the device due to minority carrier which is called as reverse saturation current.

(iv) Maximum forward current

- It is defined as the maximum value of forward current that can be allowed to pass through a forward biased diode without damaging it.
- This rating is also called as peak surge current rating and it is specified only for 1 cycle of input ac waveform.
- It is non-repetitive current rating.

Q.5(b) Draw a frequency response of single stage common emitter amplifier. Explain the effect of coupling capacitor and junction capacitor. **[4]**

(A)



Effect of coupling capacitor and junction capacitor:

Due to coupling capacitor and junction capacitor voltage gain reduces.

- Amplifier gain reduces due to coupling capacitor C1, C2 at low frequencies. Because coupling capacitors will offer high reactance and hence they will act as a open circuited.
- At high frequency voltage gain reduces due to internal junction capacitance of transistor. Because these capacitor offers very low reactance at high frequencies which will provide shunting effect across transistor junctions and hence votage gain decrease due to shunting effect.

Q.5(c) Differentiate between P-N junction diode and zener diode. **[4]**

(A)

Sr. No.	PN junction Diode	Zener Diode
(i)	It is not properly doped to control reverse breakdown.	It is properly doped to control reverse breakdown.
(ii)	It conducts only in one direction.	It conducts in both directions.
(iii)	It is always operated in forward-bias condition.	It is always operated in reverse-bias.
(iv)	It has no sharp reverse breakdown.	It has quite sharp reverse breakdown.
(v)	It burns immediately, if applied voltage exceeds the breakdown voltage.	It will not burn, but functions property in breakdown region.
(vi)	It is commonly used for rectification purpose.	It cannot be used for rectification, but commonly used for voltage regulation.

Q.5(d) Define the following terms : **[4]**

(i) PIV of diode **(ii) Efficiency of Rectifier**

(iii) Rectification **(iv) Ripple factor**

(A) **(i) PIV of diode:** The maximum value of reverse voltage that a diode can withstand without destroying its PN junction during the non-conduction period is called peak inverse voltage.

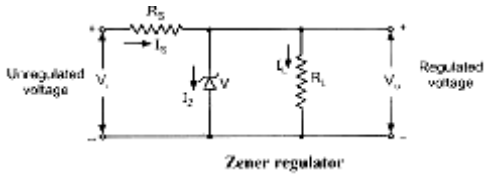
(ii) Efficiency of rectifier : It is the ratio of D.C. powerdelievered to the load to the A.C. input from secondary transformer secondary.

(iii) Rectification : It is the process in which A.C. is converted the D.C.

(iv) Ripple Factor: It is the ratio of the rms value of a.c. components present in the output of the rectifier to the value of the d.c. component present.

Q.5(e) Explain the working of zener as a voltage regulator. [4]

(A)



Zener regulator

Operating Principle : For proper operation, the input voltage Vimust be greater than the Zener voltage Vz. This ensures that the Zener diode operates in the reverse breakdown condition. The unregulated input voltage Vi is applied to the Zener diode. Suppose this input voltage exceeds the Zener voltage. This voltage operates the Zener diode in reverse breakdown region and maintains a constant voltage, i.e. Vz = Vo across the load inspite of input AC voltage fluctuations or load current variations. The input current is given by,

IS = Vi– Vz/ Rs = Vi – Vo / Rs

We know that the input current IS is the sum of Zener current Izand load current IL.

Therefore, IS = Iz + IL

OR Iz = IL

As the load current increase, the Zener current decreases so that the input current remains constant. According to Kirchhoff's voltage law, the output voltage is given by,

Vo = Vi – Is Rs

As the input current is constant, the output voltage remains constant (i.e. unaltered or unchanged). The reverse would be true, if the load current decreases. This circuit is also correct for the changes in input voltage.

As the input voltage increases, more Zener current will flow through the Zener diode. This increases the input voltage Is, and also the voltage drop across the resistor Rs, but the load voltage Vo would remain constant. The reverse would be true, if the decrease in input voltage is not below Zener voltage.

Thus, a Zener diode acts as a voltage regulator and the fixed voltage is maintained across the load resistor RL.

Q.5(f) State advantages and disadvantages of bridge rectifier. [4]

(A) Advantages of Bridge Rectifier

(i) It can be used in application allowing floating output terminals, i.e. no output terminal is grounded.

(ii) The need for centre-tapped transformer is eliminated.

(iii) If stepping up or stepping down of AC voltage is not needed, then it does not even require any transformer.

(iv) The transformer is less costly as it is required to provide only half the voltage of an equivalent centre-tapped transformer used in a full wave rectifier.

(v) The PIV is one-half that of the centre-tap circuit.

(vi) The output is twice that of the centre-tap circuit for the same secondary voltage.

(vii) The transformer utilization factor is very large.

Disadvantages of Bridge Rectifier

(i) It requires four semiconducting diodes.

(ii) Two diodes in series conduct at a time on alternate half cycles. This creates a problem when low DC voltages are required. This leads to poor voltage regulation.

Q.6 Attempt any FOUR of the following : [16]

Q.6(a) Compare half wave, centre tap and bridge type full wave rectifier on the basis of : [4]

(i) Ripple factor (ii) Rectification efficiency

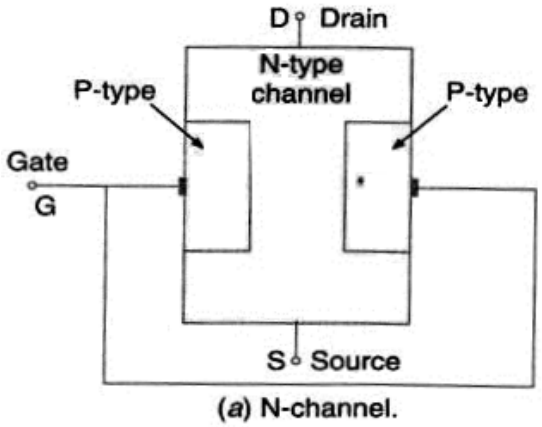
(iii) TUF (iv) PIV

(A)

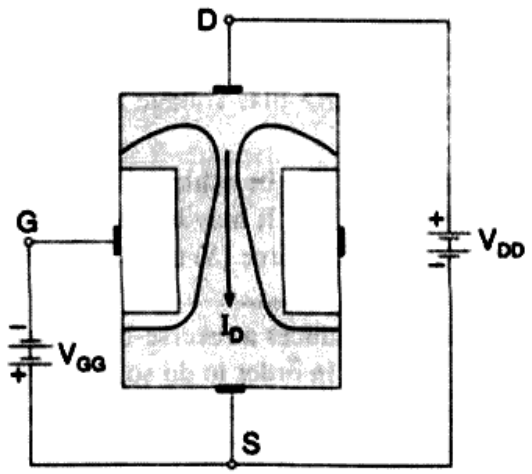
	Half wave	Centre tap	Bridge type full wave
Ripple factor	1.21	0.482	0.482
Rectification efficiency	40%	81.2%	81.2%
TUF	0.287	0.693	0.812
PIV	Vm	2 Vm	Vm

Q.6(b) Draw and explain constructional details of N–channel JFET. [4]

(A)



(a) N-channel.



(i) VGS = 0V

When a voltage is applied between the drain and source with a D.C supply voltage (VDD) with VGS = 0V, the electrons flows from source to drain through the narrow channel existing between the depletion regions. This constitutes drain current (ID). The value of drain current is maximum when VGS = 0V. This current is designated by the symbol IDSS.

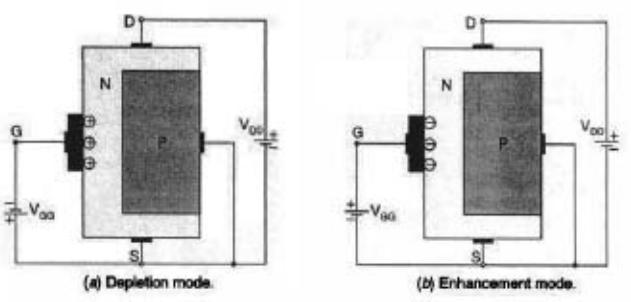
(ii) When VGS is negative

When VGS is increased above zero, the reverse voltage across the gate source junction is increased. As a result depletion regions are widened. This reduces effective width of channel controls the flow of drain current through the channel.

If VGS increased further, two depletion regions touch each other. The drain current reduces to 0. The gate to source at which drain current reduces to 0 is called as pinch off voltage.

Q.6(c) Explain the working principle of n-channel depletion type of MOSFET. [4]

(A)

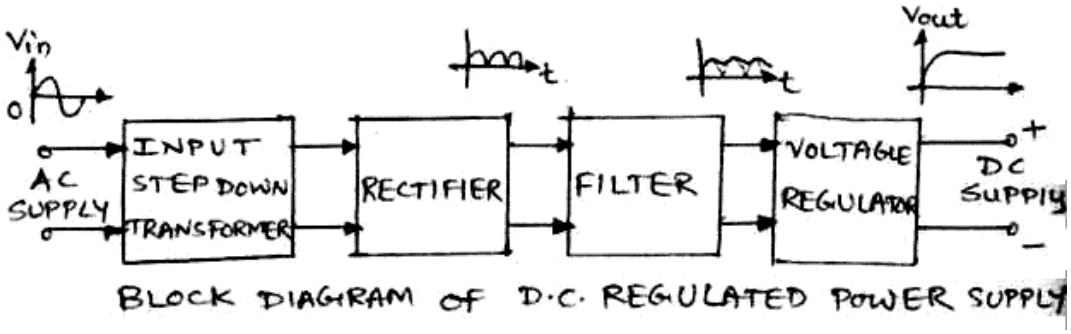


Basic Operation : This MOSFET can be operated in two different modes, namely, Depletion Mode and Enhancement Mode.

In depletion Mode, MOSFET is with negative gate to source voltage. The negative voltage on the gate induces a positive charge in the channel. Due to this, free electrons in the vicinity of positive charge are repelled away in the channel. Thus, the channel is depleted of free electrons, reducing the number of free electrons that are passing through the channel. Thus, negative gate to source voltage is increased and the value of drain voltage VGS is totally depleted of free electrons and hence drain current reduces to zero.

Q.6(d) Draw the block diagram of regulated power supply and explain the working of each block. [4]

(A)



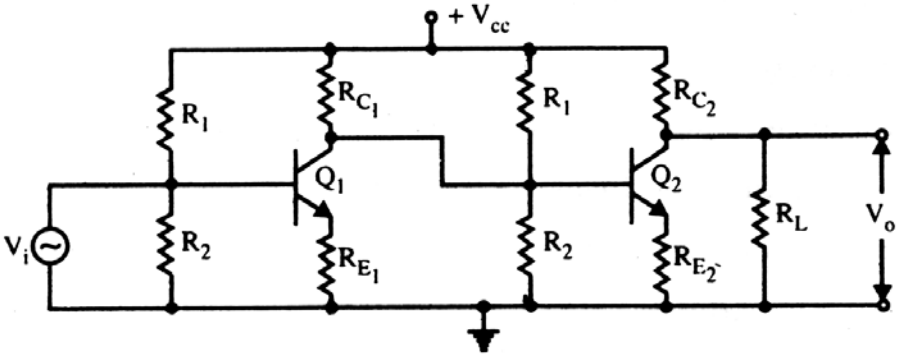
Explanation-Transformer- Step downs the 230 v AC into low voltage AC Vm Rectifier- Converts AC into DC.

Filter-Converts pulsating DC into pure DC.

Voltage regulator- It converts fluctuating DC into Constant DC across the load.

Q.6(e) Draw the net circuit diagram of direct coupled amplifier. Give tis two applications. [4]

(A)



Two stage direct coupled CE amplifier

Applications :

The applications of direct coupled amplifier are as follows :

(i) It is used is analog computation.

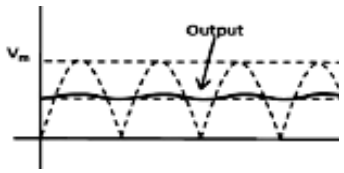
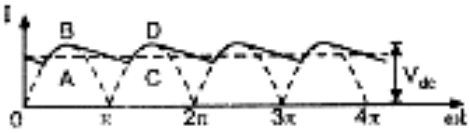
(ii) It is used in power supply voltage regulators.

(iii) It is used for bioelectric measurements.

(iv) It is used in linear integrated circuits.

Q.6(f) Compare LC and CLC filter. **[4]**

(A)

Specification	LC	CLC
Components	1 Inductor and 1 capacitors	1 Inductor and 2 Capacitors
Ripple Factor	0.83/LC	3330/C1C2R1
Waveforms		

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