Abdullah id 12406

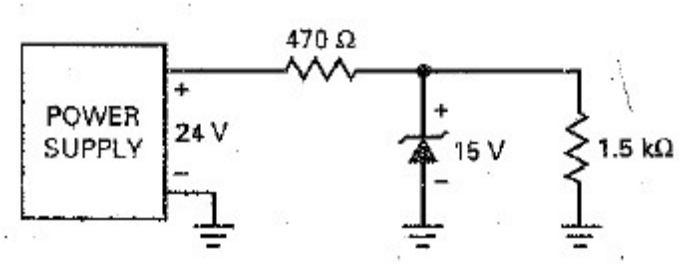
Subject Name: Basic Electronics
Instructor: M Khalid Hamid

Q1:

a. **An unloaded zener regulator has a source voltage of 24 V, a series resistance of 470 Ω, and a zener voltage of 15 V. What is the zener current?**
ANSWER:

= (source voltage)-(zener voltage)\resister
= 24-15/470
9/470 = 0.01914
Zener current= 0.01914

b. **If the zener diode is disconnected in the following figure, what is the load voltage?**



V3 = 24v

V2= 15V

RS=470^

RL = 1.5K^

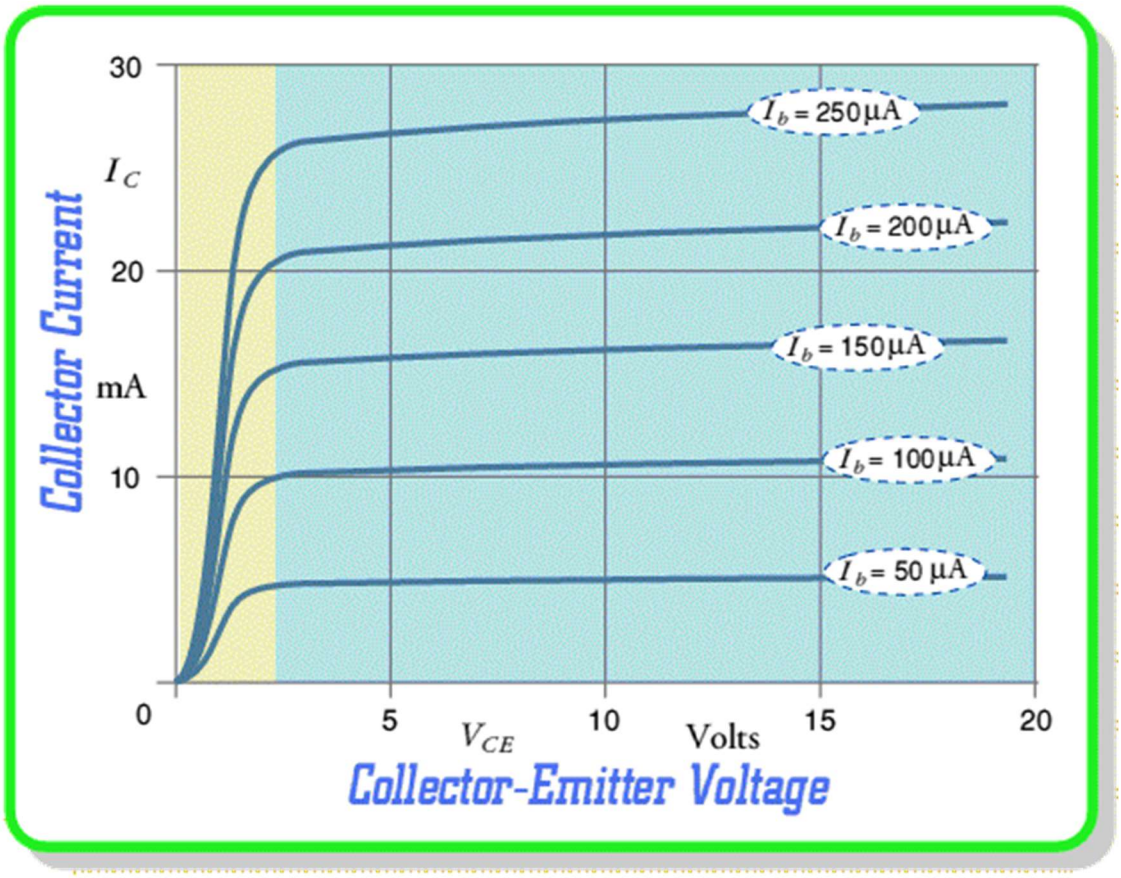
VL=(RL/(RS+R1) VS (Voltage divider formula)

Vl= (1.5 k^/(470^+1.5 k^)24v

VL = 18.27V

Load voltage = 1827vs

Q2: **Draw a set of collector curves for BJT Transistor. Then using these curves show where the four operating regions of a transistor are located?**



four operating regions of a transistor are located?

as **Active region, Saturation region, Cutoff region** and **Inverse active region**.

- **Active region:**
  The curves would ideally be horizontal straight lines, indicating that the collector behaves as a constant current source independent of the collector voltage

- **Saturation region:**
  saturation region, which is highly nonlinear and is not usable for amplification.

  Cutoff region:
  The cutoff region of operation occurs for base currents near zero. In the cutoff region, the collector current approaches zero in a nonlinear manner and is also avoided for amplification applications.

Q3 Draw and explain Transistors connected in the following configurations.

1. **Common emitter**

   In electronics, a common-emitter amplifier is one of three basic single-stage bipolar-junction-transistor amplifier topologies, typically used as the voltage amplifier. In this circuit the base terminal of the transistor serves as the input, the collector is the output, and the emitter is common to both, hence its name. The analogous FET circuit is the common-source amplifier, and the analogous tube circuit is the common-cathode amplifier.

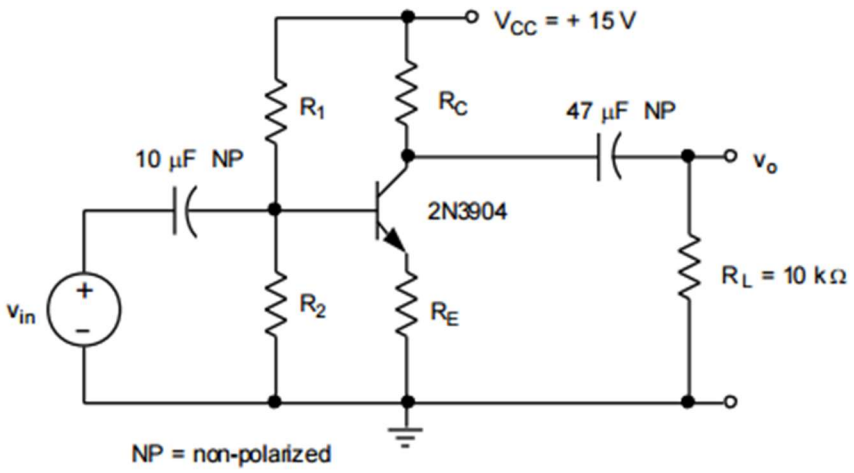
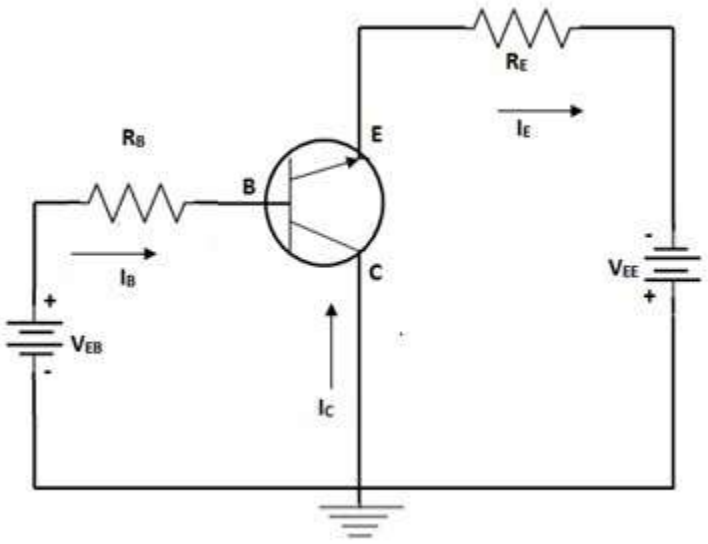


Figure 1. Common-emitter transistor amplifier.

2. **Common collector**

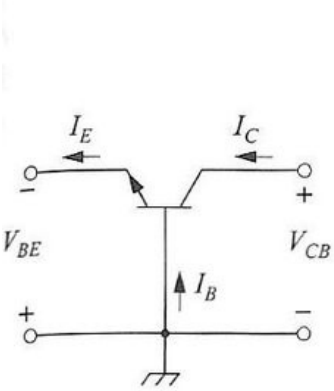
   In electronics, a common collector amplifier is one of three basic single-stage bipolar junction transistor amplifier topologies, typically used as a voltage buffer. In this circuit the base terminal of the transistor serves as the input, the emitter is the output, and the collector is common to both, hence its name. The analogous field-effect transistor circuit

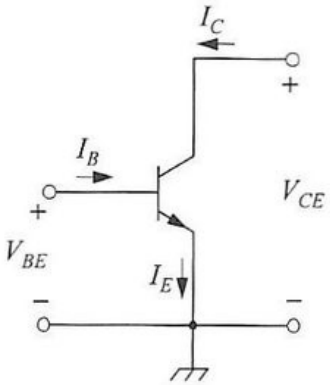
is the common drain amplifier and the analogous tube circuit is the cathode follower

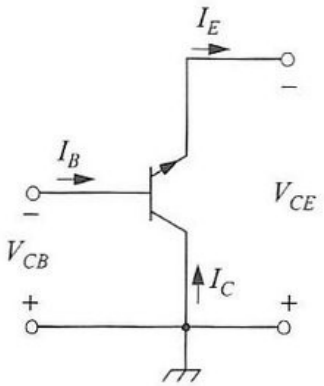


3. **Common base:**

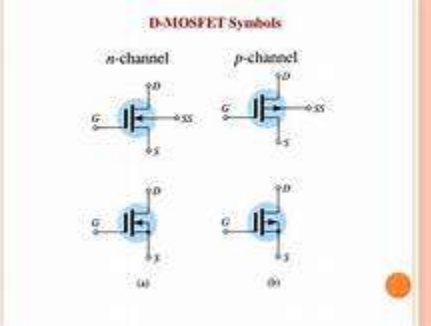
In electronics, a common-base (also known as grounded-base) amplifier is one of three basic single-stage bipolar junction transistor (BJT) amplifier topologies, typically used as a current buffer or voltage amplifier.







Q4: Draw an E-MOSFET showing the p and n regions, then explain the off and on action?



Explanation:

In E-MOSFET the p substrate now extends all the way to the silicon dioxide. As you can see an n channel between the source and the drain.

when the gate voltage is zero the current between source and drain is zero. That's why an E-MOSFET is normally off.

The JFET is referred to as a depletion-mode device because its conductivity depends on the action of depletion layers. The E-MOSFET is classified as an enhancement-mode device because a gate voltage greater than the threshold voltage enhances its conductivity with zero gate voltage. A JFET is on, whereas an E-MOSFET is off Therefore the E-MOSFET is considered to be a normally off device.

Q5:

List and compare the advantages and disadvantages of BJT and FET amplifiers.

The advantages of disadvantages of BJT and FET amplifiers: Lack of Thermal Runaway: The Bipolar Junction Transistors may be destroyed by thermal runaway. The problem with the bipolar transistors is the negative temperature coefficient of . When the internal temperature increases, decreases. This increases the collector current, forcing the temperature higher. Advantages, disadvantages and application of FET over BJT 1 FET gas high input impedance of several mega ohms. 2 The noise produced by a FET is less than that produced by a BJT. 3 FETs are less effect by radiation compared to BJT. 4 FET has no offset voltage at zero drain current and hence it forms an excellent signal chopped.

Advantages of BJT:

They have a better voltage gain

They have a high current density

They have a low forward voltage

It can be operated in low to high power application

BJT has a large gain bandwidth

BJT shows better performance at high frequency

Disadvantages of BJT:

BJT has a low thermal stability

BJT is most effective by radiation

BJT has more noise produced

BJT has a low switching frequency

BJT has a very complex control

The switching time is not very fast compared to a high alternating frequency of current and voltage

Advantages of FETs

They are devices controlled by voltage with a very high input impedance (107 to 1012 ohms)

FETs generate a lower noise level than the Bipolar Junction Transistor (BJT)

FETs are more stable than BJT with temperature

FETs are easier to manufacture than the BJT, because they require fewer steps to be built and they allow more integrated devices in the same IC

FETs behave like resistors controlled by voltage for small drain-source voltage values

The high input impedance of FET allows them to withhold loads long enough to allow its usage as storage elements.

disadvantages of FET

FETs can be damaged in handling due to static electricity.

Some types of FETs exhibit poor linearity.

FETs amplifiers usually exhibit poor frequency response because of high input capacitance

a. Explain what happens when drain current starts to increase through a power FET.

when the current increases through FET power it reaches the saturation current ld(sat)· Beyond this point, the device is biased in the ohmic region. Therefore, ld cannot increase, even though Vgs increases. To ensure hard saturation, a gate voltage of Vgs(on) well above Vgs(th) is usedwhen the drain current start to increase the positive drain potential opposes the gatevoltage bias and reduces the surface potential in the channel.the channel inversion layer charge decrese with incresing drain source voltage and ultimately . it become zero when the drain source voltage equal to (Vgs-Vgs(th)) this point is called the channel pinch off voltage where the drain current become saturated