Department of Electrical Engineering
Mid-term
Date: 24/08/2020

Course Details

Course Title: Electronic Circuit Design **Module:**
Instructor: **Total Marks: 30**

Student Details

Name: **Student ID:**

Student Signature:

Q1. For the circuit given in figure 1. Answer the following: Marks 09

a) Which type of transistor is that?
b) Label the Drain, Source and Gate.
c) Determine the values of V_{DS} and V_{GS}

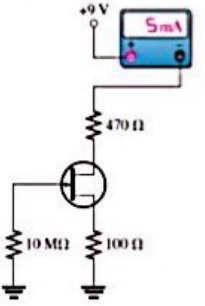

Figure 1

Q2. **Explain** the drain characteristic curve of D-MOSFET given below in Fig. 2. Marks 06

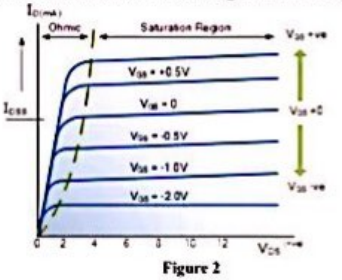

Figure 2

Q3. **Sketch** the hybrid equivalent for common emitter transistor. Write equations for the transistor in common emitter configuration. Marks 05

Q4. **Explain** why both types of MOSFETs have an extremely high input resistance at the gate. (Marks 01) Marks 10

In **what** mode an *n*-channel D-MOSFET with a positive V_{GS} is operating? (Marks 01)

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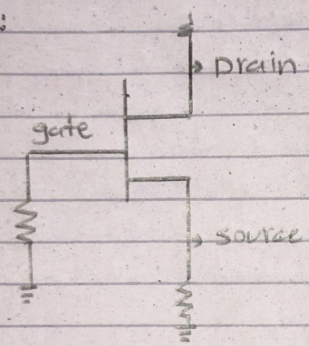
Question # 01

part (a):

The Transistor is PNP

part (b):



part (c):

$V_S = (5mA)(100\,\Omega)$

$= 0.5V$

$V_D = 6V - (5mA)(470\,\Omega)$

$= 6.65V$

$V_G = 0V$

$V_{GS} = V_G - V_S = 0V - 0.5V = -0.5V$

$V_{DS} = V_D - V_S = 6.65 - 0.5 = 6.15V$

Question#02

Answer:

Depletion Mode:

The depletion mode MOSFETS are generally known as switched ON device. Because these transistor are generally closed when there is no bias voltage at the gate terminal. if the gate voltage increases in positive, then the channel width increases in depletion mode.

Characteristics of Curve of Depletion Mode MOSFET:

The characteristic of the depletion mode MOSFET transistor are given ~~below~~. above. This characteristics mainly gives the relationship between drain-source voltage (V_{DS}) and drain current (I_D). The small voltage at the gate controlls the

Current flow through the channel.

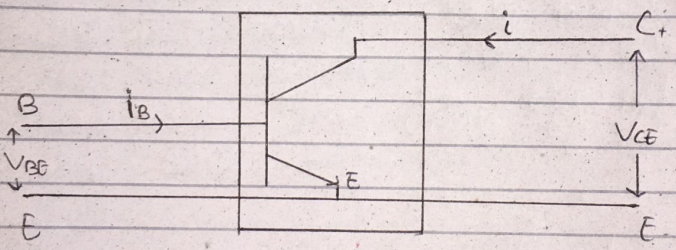
The channel between drain and Source act as a good Conductor with zero bias voltage at gate terminal. The channel width and drain current increases if gate voltage is positive and these two channel width and drain current decreases if the gate voltage is negative.

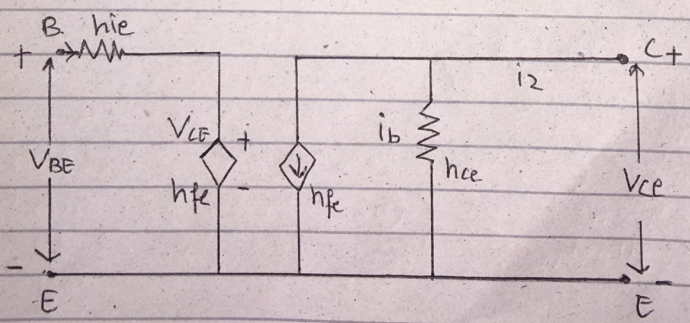
Question#03

Answer:

Hybrid Equilent For C.E Transistor:

In Common emitter transistor Configuration the input signal applied between the base and emitter terminals of the transistor and output appears between the Collector and emitter terminals.





The input Voltage (V_{BE}) and output Current (i_c) are given by the following equation:

$$V_{BE} = h_{ie} \cdot i_b + h_{re} - V_c$$

$$I_e = h_{fe} \cdot I_b + h_{oe} - V_c$$

Question # 04

Answers:

(1) :→

MOSFETs have a very high input resistance because the gate is insulated from the channel by an SiO_2 layer.

(2) :→

An N-channel D-MOSFET with a positive V_{GS} is operating in the enhancement mode.

(3) :→

The gate to source Voltage of an N-channel JFET must be zero or negative in order to maintain the required reverse bias condition.

(4) :→

Difference between BJT and FET :-

→ BJT is a Bi-polar junction transistor in this transistor there is a flow of Both majority and minority charge Carriers.

→ While FET are Uni-polar only flow on majority charge Carriers.

→ BJTs are Current Controlled.

→ FETs are Voltage Controlled.

- BJTs Consists of three terminals namely Emitter, Base, Collector.
- FETs Consists of three terminals namely Source, Drain, gate.
- BJTs have a higher max frequency and a higher cutt-off frequency.
- FETs have Low to medium gain.

Question#04

part(5):

MOSFETs Called IGFET because metal oxide (The MO part of MOSFET is an insulator that saperate the gate electrode from the body of the field effect transistor.

part (6):⇒

- The input output-transfer characteristics of the JFET is not as straight forward as it is for the BJT.

- In a BJT, $\beta(h_{FE})$ defined the relationship between I_B (input current) and I_C (output-current).

- In a JFET the relationship b/w V_{GS} and I_D is used to define the transfer characteristics.

$$I_D = I_{DSS}\left(1 - \frac{V_{GS}}{V_P}\right)$$

Question #04

part (7):

In the Common base amplifier Configuration the input Current exceeds all other Current in the circuit, including the out put Current.
the Current gain of this amplifier is actually less than 1.