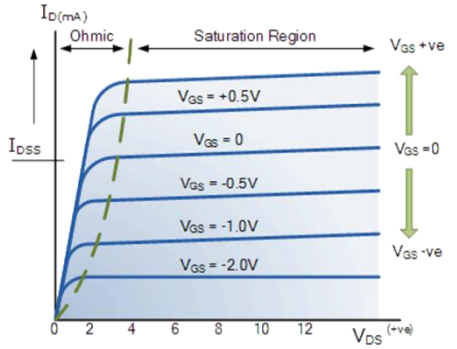
Department of Electrical Engineering
Assignment
Date: 14/04/2020

Course Details

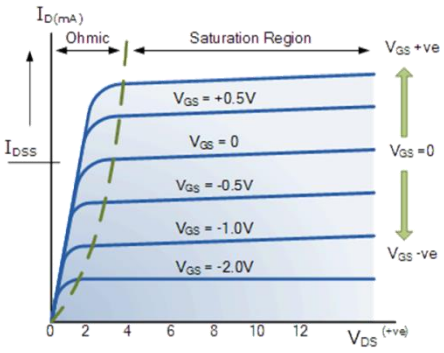
Course Title: Electronic Circuit Design **Module:** 04
Instructor: Engr.Mujtaba Ihsan Sir **Total Marks:** 30

Student Details

Name: FAWAD AHMAD **Student ID:** 13204

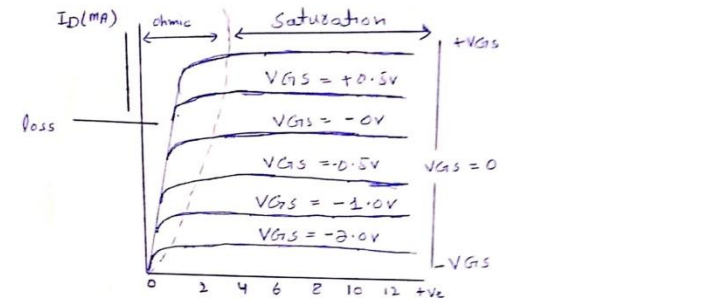
Q1.	(a)	**Explain** the drain characteristic curve of D-MOSFET given below. 	Marks 07 CLO 1
	(b)	**Sketch** the hybrid model and write equations for the transistor in common emitter configuration.	Marks 06 CLO 1
Q2.		A certain operational amplifier has a common mode gain of 0.6 and an open loop differential voltage gain of 400,000. **Evaluate** the CMRR & express it in decibels.	Marks 05 CLO 2
Q3.	(a)	**Explain** the concept behind negative feedback in operational amplifiers.	Marks 06 CLO 2
	(b)	**State** the following statement as **True** or **False** and also give the reason for your answer: "The output of a summing amplifier is positive"	Marks 06 CLO 2

<u>Q1(a).</u> Explain the drain characteristic curve of D-MOSFET given below.

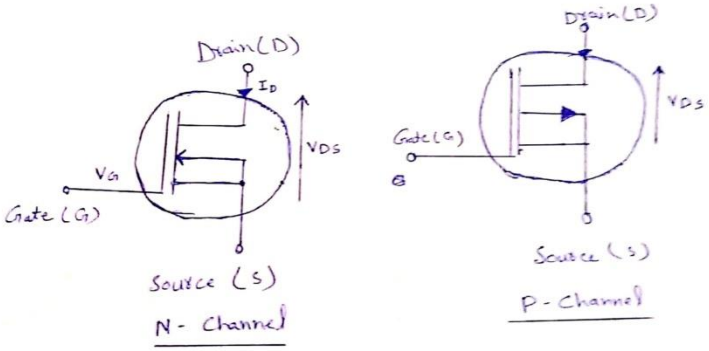


<u>Answer:</u>

The V-I characteristics of the depletion mode MOSFET transistor are given below. This characteristic mainly gives the relationship between drain- source voltage (V_{DS}) and drain current (I_D). The small voltage at the gate controls the current flow through the channel.
The channel between drain and source acts as a good conductor with zero bias voltage at gate terminal. The channel width and drain current increases if the gate voltage is positive and these two (channel width and drain current) decreases if the gate voltage is negative.



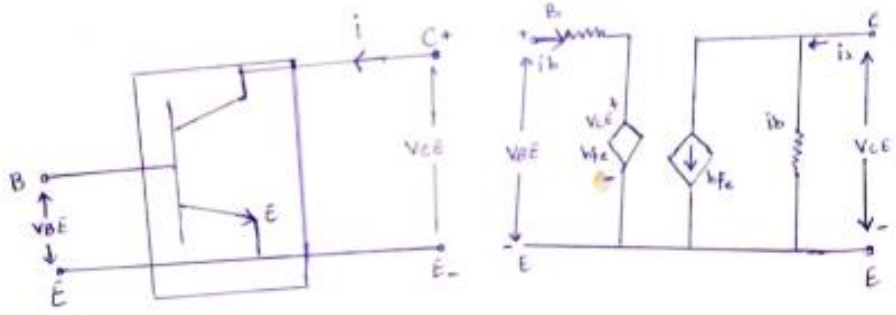
Characteristic Curve of Depletion mode MOSFET



Q1(part B) .Sketch the hybrid model and write equations for the transistor in common emitter configuration?

Answer:

In common emitter transistor configuration the input signal is applied between the base and emitter terminal of the transistor and output appears between the collector and emitter terminal. The input voltage (Vbe) and the output current (Ic) are given by the following equations:

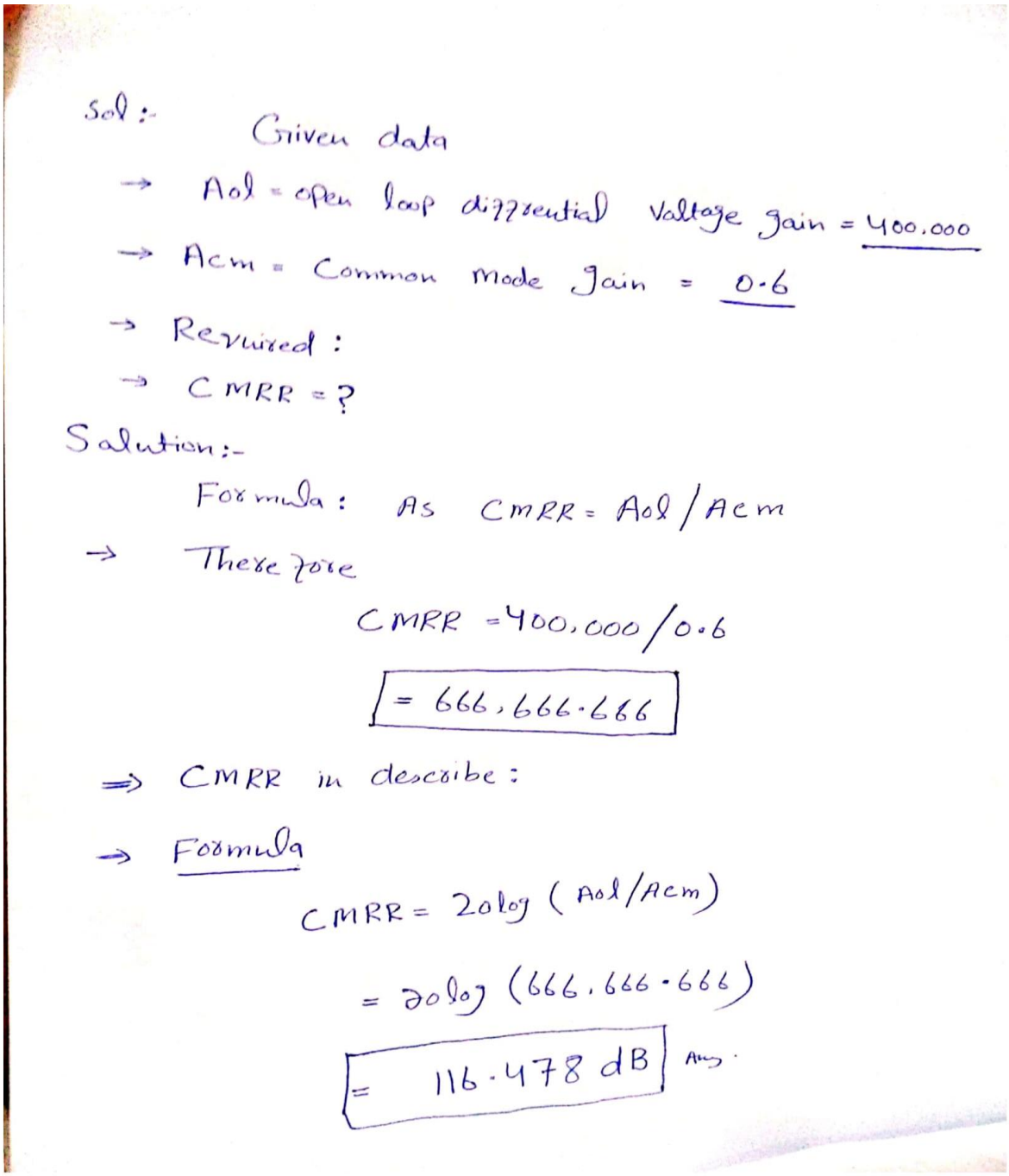


Equations:

- **Vbe = hie.ib + hre.Vc**
- **Ie = hfe.ib + hoe.Vc**

Q.2: A certain operational amplifier has a common mode gain of 0.6 and an open loop differential voltage gain of 400,000. Evaluate the CMRR & express it in decibels.

Answer:



Sol:-

Given data

→ Aol = open loop differential voltage gain = 400,000

→ Acm = Common mode gain = 0.6

→ Required :

→ CMRR = ?

Solution:-

Formula : As CMRR = Aol / Acm

→ Therefore

CMRR = 400,000 / 0.6

= 666,666.666

⇒ CMRR in describe :

→ Formula

CMRR = 20log (Aol/Acm)

= 20log (666,666.666)

= 116.478 dB Ans.

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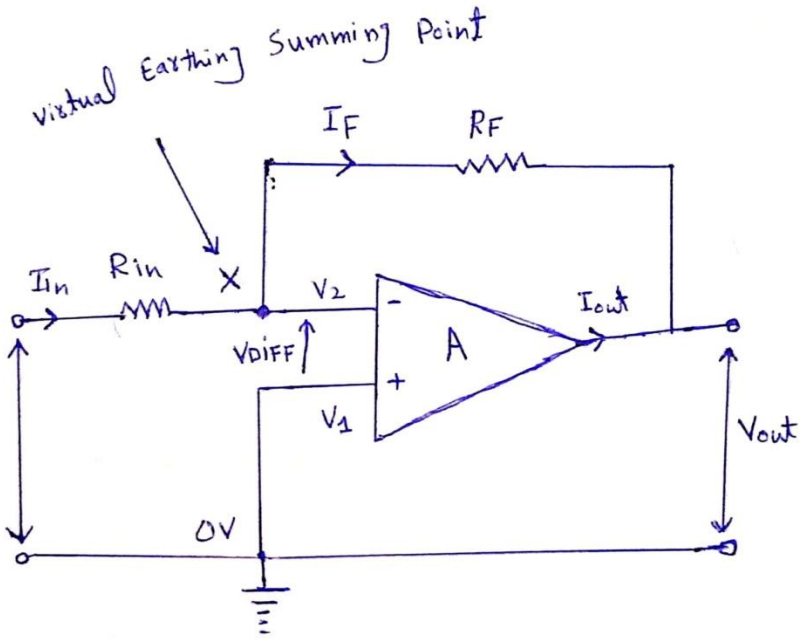
Q.3(part A): Explain the concept behind negative feedback in operational amplifiers?

Answer:

Negative Feedback is the process of "feeding back" a fraction of the output signal back to the input, but to make the feedback negative, we must feed it back to the negative or "inverting input" terminal of the op-amp using an external **Feedback Resistor** called R*f*. This feedback connection between the output and the inverting input terminal forces the differential input voltage towards zero.



Q.3(Part B): State the following statement as True or False and also give the reason for your answer:"The output of a summing amplifier is positive"?

Answer:

The Answer is **TRUE.**

Likewise, when the **summing** point is connected to the non-inverting input of the op-**amp**, it will produce the **positive sum** of the input voltages. This allows **the output** voltage to be easily calculated if more input resistors are connected to the **amplifiers** inverting input terminal.