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Dep # Bs cs
Paper # Basic Electronics
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Semester # 4th

(Q:NO: 1)

①

(Q: No: 1)

(a)

Given

$$I_s = \frac{24V}{470\Omega}$$

51.06 mA

special Purpose diode

Since the load voltage is 15

$$I_L = \frac{15V}{1.5 k\Omega}$$

$I_L = 10 mA$

The Zener Current in the diff b/w two current

$I_z = 51.06 mA - 10 mA$

$I_z = 41.06 mA$

←——————————————→

(Q: 1 part b)

given data

Load terminal = 1500 Ω

input Current = E_i = 24

Resistance = R = 470 Ω

Required data

load voltage = V_z = ?

As we know that

$$V_L = \frac{R_L E_i}{R + R_L}$$

(2)

Putting values.

$$\Rightarrow V_L = \frac{R_L E_i}{R + R_L}$$

$$V_L = \frac{1500 \times 24}{470 + 1500}$$

$$\Rightarrow V_L = \frac{36000}{1970}$$

$$V_L = 18.27\ V$$

Result = $V_L = 18.27\ V$.

(Q No 2)

Collector characteristics Curves.

Consider the circuit of fig (1) which we will use to learn about the operation of the transistor in a circuit by adjusting the voltage source V_{BB} and V_{CC}

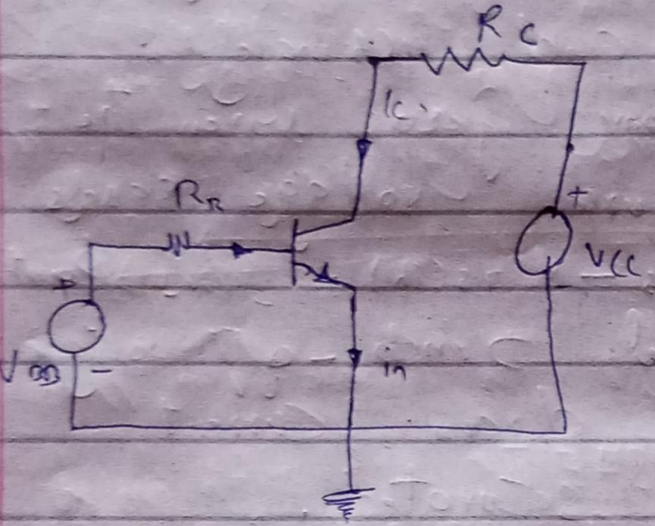
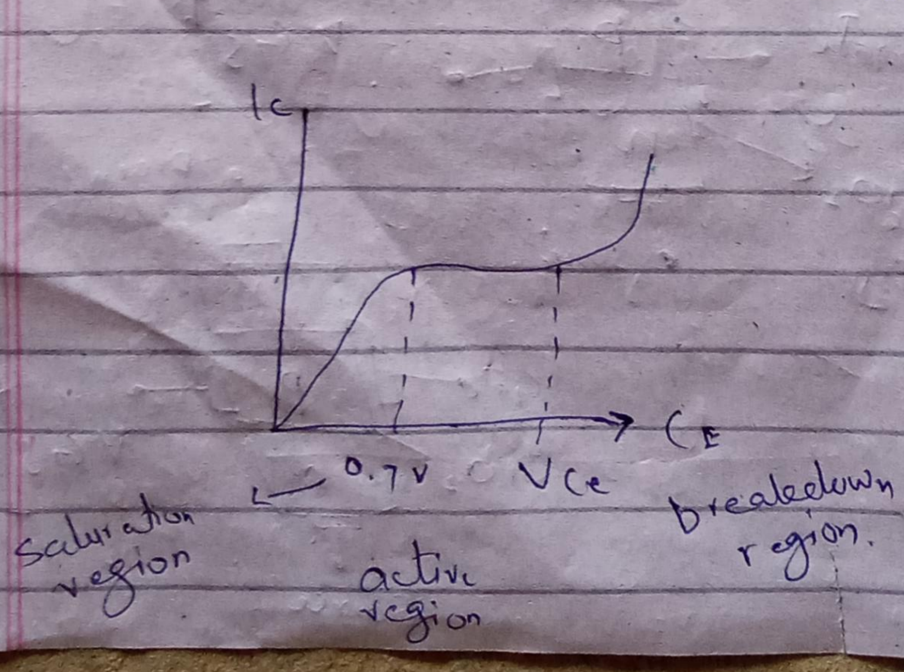


fig (1)

A graph of the collector, I_C versus us V_{CE} is shown in fig (2)



suppose
V_{BB} and V_{CE} are set to produce a current $i_B > 0$ and $V_{CE} = 0V$, Then both BE and BC function are forward biased. The saturation region corresponds region to the case where both function are forward biased.

As V_{CE} increases and reaches about 0.7 V then BC function becomes reverse biased.

When V_{CE} exceeds 0.7 V the transistor goes into the VCE . the active region.

or linear region. Corresponds to the BE function forward biased and BC reverse biased. This is the normal mode of operation of the transistor. e.g as in amplifier

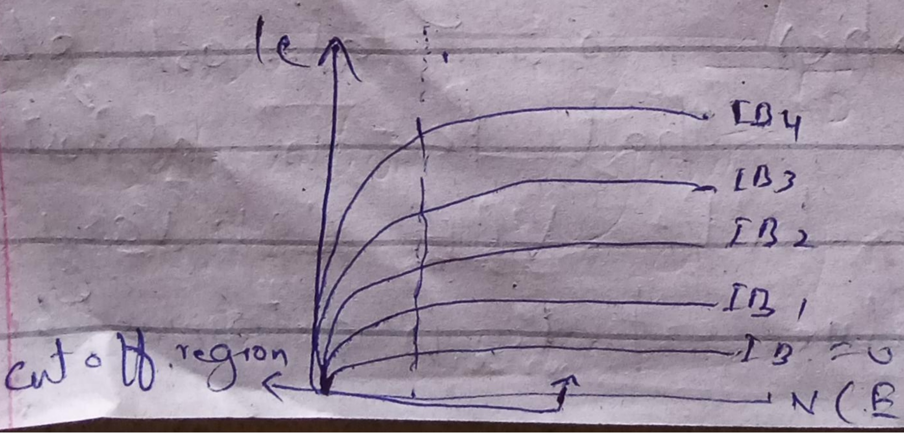
In the active region the collector characteristics is almost flat meaning that Ic is almost constant but VCE can vary

The value of Ic is determined by IB

if VCE increases too much the transistor goes into the breakdown region This should be avoided.

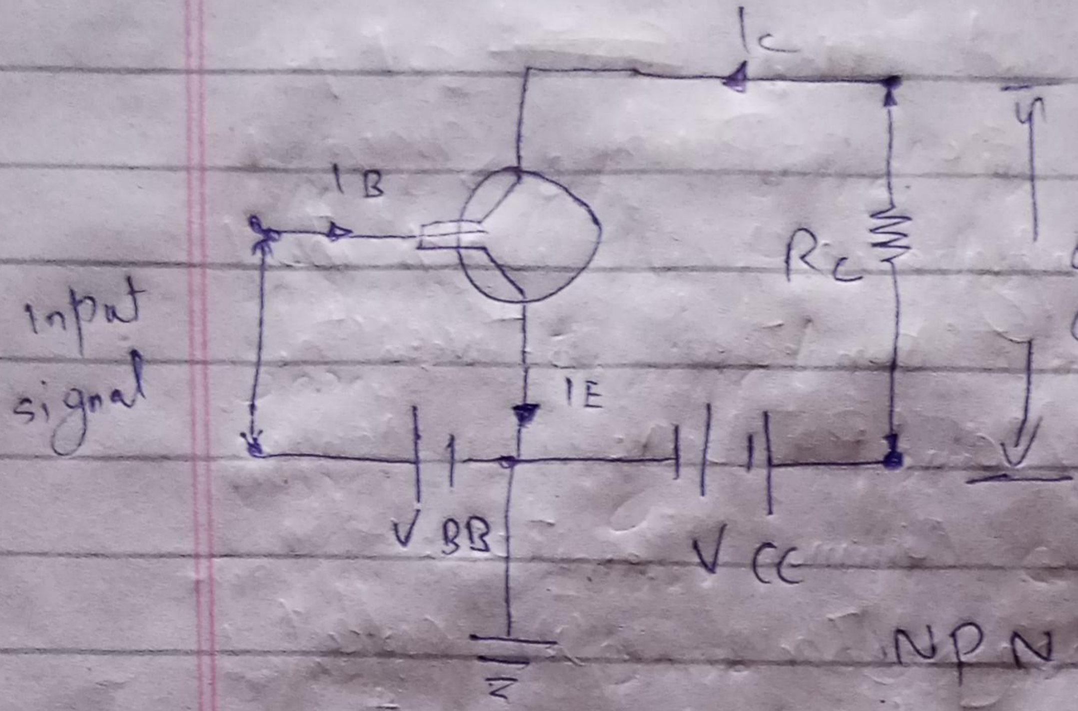
Fig C)

collecter Curves for different values of base Current. When IB = 0 A, the transistor is in its cut off region and only a small leakage Current flows as Ic.

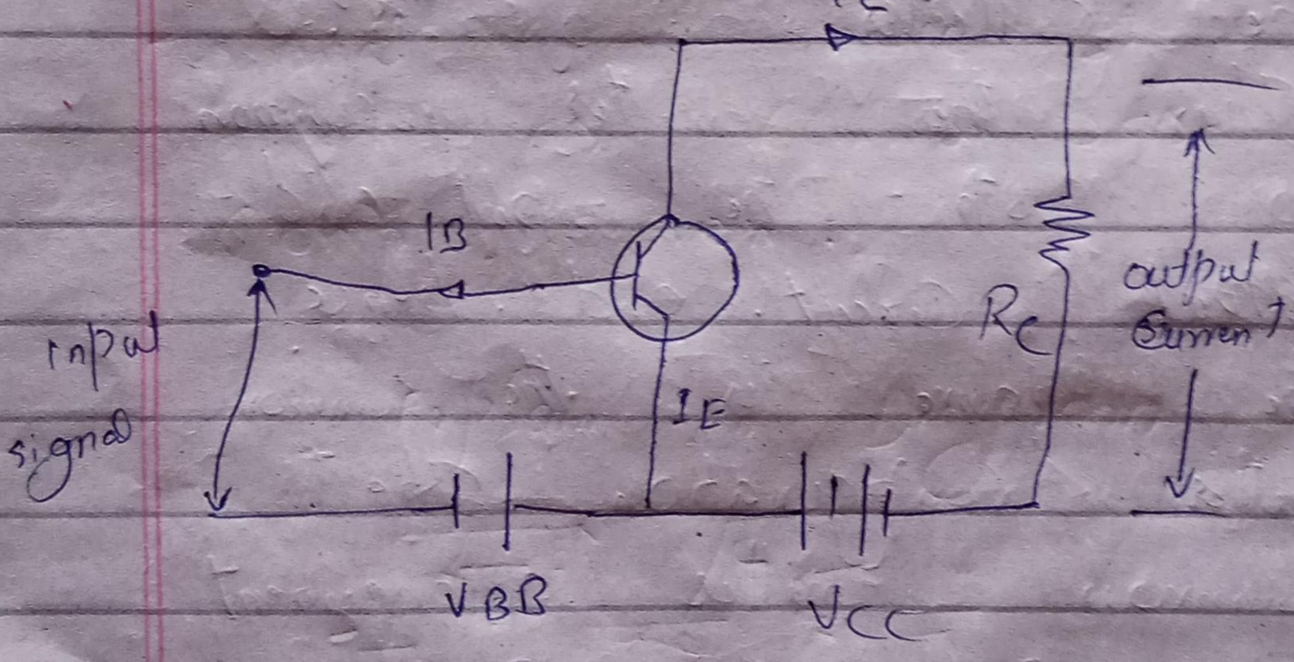


When V_{GS} is greater then $V_{GS(th)}$ the curve appear linear and the device begin to conduct and turns 'ON' Also the drain current is controlled by the gate voltage.
The almost vertical part of the graph is the ohmic region and the almost horizontal parts are the active region. It is equivalent to a register. when biased in the active region it is equivalent to to a current source.
In the cutoff region the gate source voltage is less then the gate threshold voltage and the device is an open circut or OFF.
In the ohmic region the device acts as a resistor equivalent to $\frac{V_{DS}}{I_D}$. In the saturation region the drain current is a function of gate source voltage.

Q.No:3.



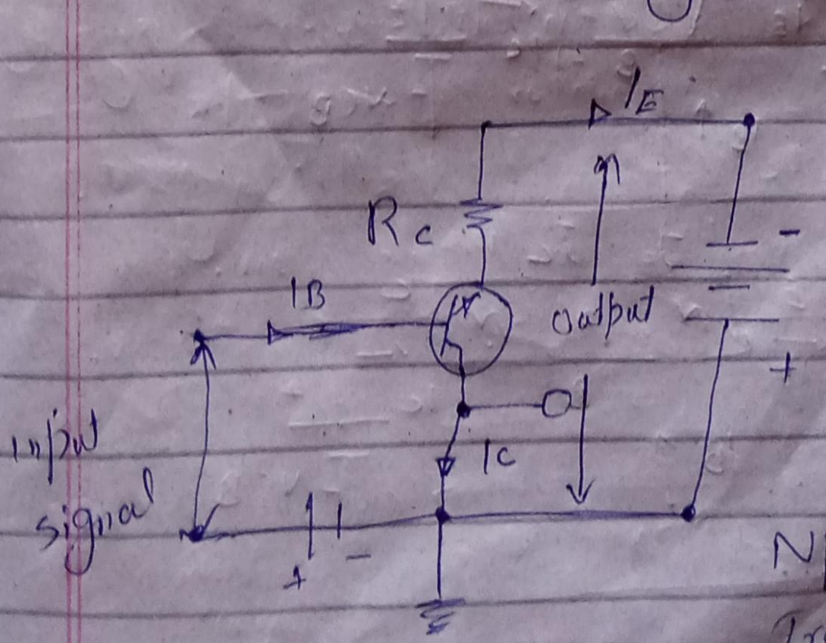
NPN Transistor.



PNP Transistor

2) Common Collecter.

The configuration in which the collecter is common between emitter and base is known as CC configuration. In CC configuration the input circuit is connected between emitter and base and the output is taken from the collecter and emitter. The collecter is common to both the input and output circuit and hence the name common collecter connection or common collecter configuration.



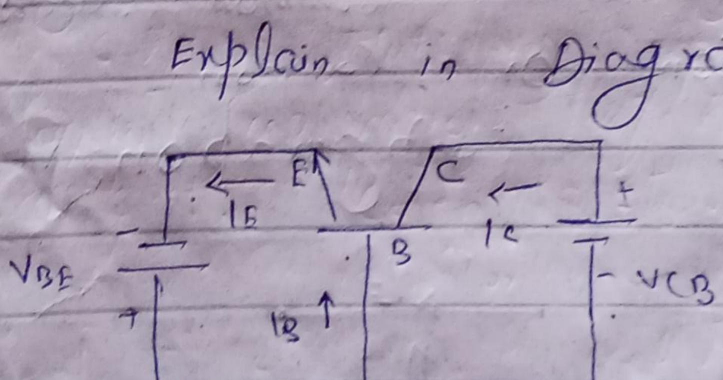
NPN Transistor.

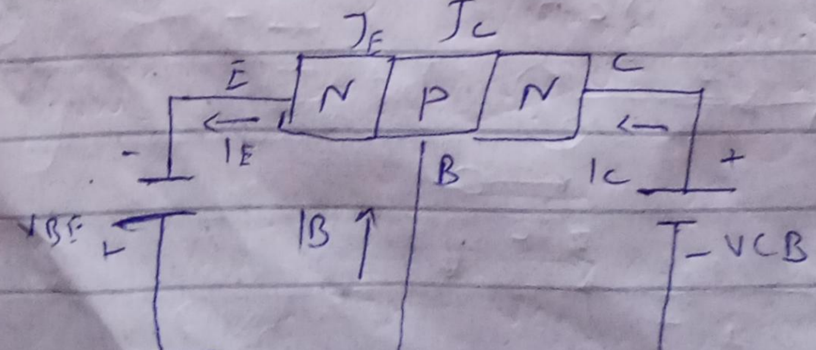
Q: No: 3

3- Common Base.

The input Signal is applied between the emitter and base Terminal while the Corresponding output Signal is Taken across the collector and base terminal. Thus the base terminal of a transistor is Common for both input and output terminal and hence it is named as Common base Configuration.

Explain in Diagram





Common base Configuration

(Q:NO:4)

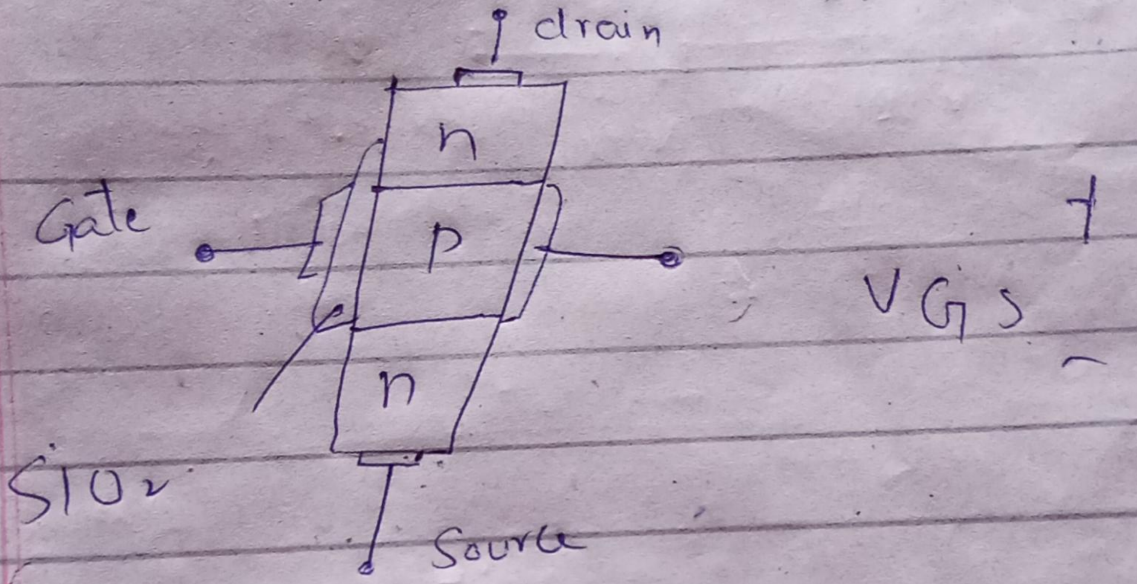
The E MOSFET in high Power application is called the power FET. The set of drain Current from an n-channel MOSFET Normally E MOSFET is an OFF device. The minimum voltage VGs that Creates the n-type inversion layer is called the Threshold voltage VGs(th). When VGs is less than VGs(th). The drain Current is approximately zero. When VGs is greator than VGs(th) The curve appear linear and the device begin to conduct and turns "ON". Also the drain current is controlled by the gate voltage.

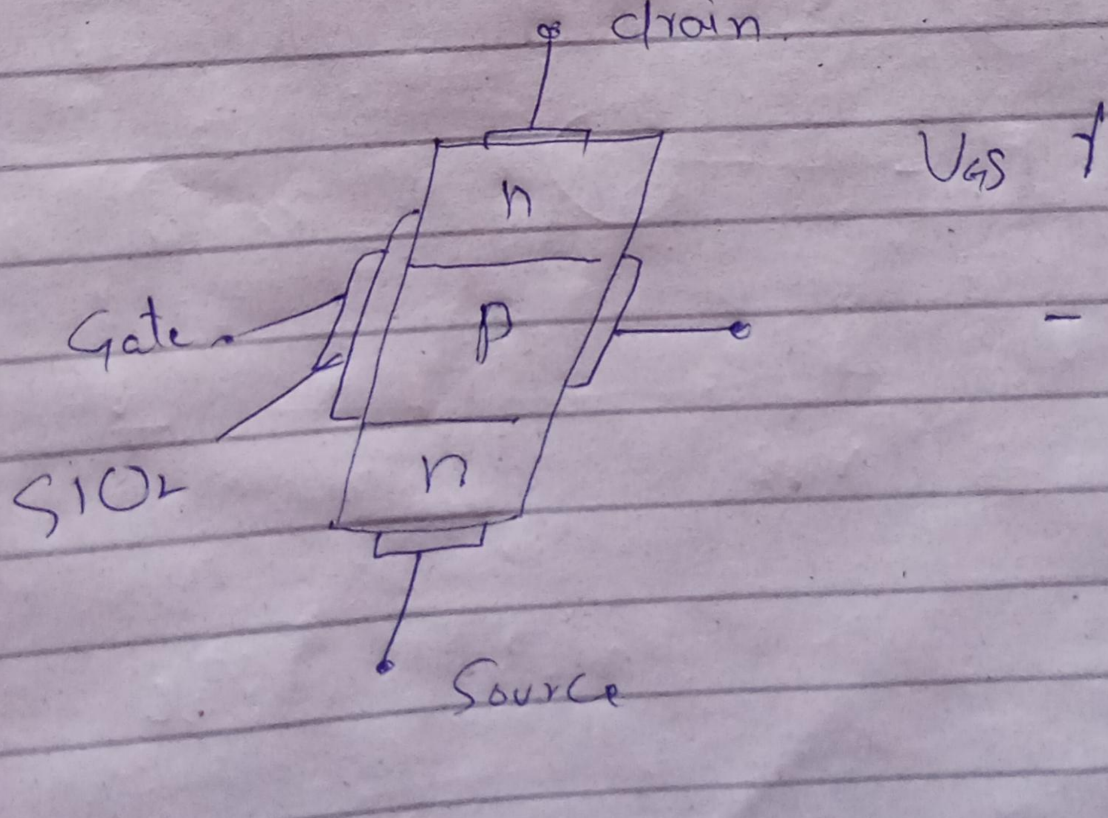
The almost vertical part of the graph is the ohmic region and the almost horizontal parts are the active region. It is equivalent to a resistor. When biased in the active region It is equilvent to registor when biased in the active region It is equilvent to a current Source. It the cut off region. The gate source voltage is less then the gate threshold voltage and the device is an open circut or (OFF).

In the ohmic region. The device acts as a resistor equilvent to $\frac{V_{DS}}{I_D}$ In the saturation region the drain current is a function of gate source voltage.

when the drain voltage is increased the positive drain potential oposes the gate voltage bias and reduces the surface potential in the channel. The channel inversion layer charge decreases with increases drain source voltage equals to $(V_{GS}-V_{GS th})$

This Point the channel pinch - off voltage where the drain current becomes saturated.





(QNo: 5 a)

Advantages of BJT.

① It has a large gain bandwidth.

② It shows the better performance at high frequency.

③ It has a better voltage gain.

④ It can be operated in low or high power application

⑤ It has high current density

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Disadvantages of BJT.

① The BJT is more an effect of radiation

② It has a very complex base control so it may lead to confusion and requires a skillful handling

③ The switching frequency of a BJT is low

④ It more noise produced

⑤ It has a low thermal stability.

(QNO: 5 a)

A dvantages of FET.

① FET are voltage sensitive device with high input impedance (10^7 to 10^{12} Ω).

② One class of FET generates lower noice than BJT.

③ FET are more temperature stable than BJT

④ Power FETs can dissipate high power and can switch large currents

⑤ The high input impedance of FETs permit them to store charge long enough to allow them to be used as storage elements.

⑥ FET are not as sensitive to radiation as BJT important consideration for space electronic appeication

(Q:NO:5 a)

Disadvantage of FET:

① FETs amplifiers usually exhibit poor frequency response because high input capacitance.

② Some types of FET exhibits poor linearity

③ FET can be damaged in handling due to static electricity.

(Q:NO: 5 b)

The EMOSFET in high power application is called the power FET. The set of drain current from an n-channel MOSFET Normally EMOSFET is an OFF device. The minimum ~~device~~ voltage V_{GS} that creates the n-type inversion layer is called the threshold voltage $V_{GS}(Th)$. when V_{GS} is less then $V_{GS}(Th)$. The drain current in approximately zero

When V_{GS} is greater then $V_{GS(th)}$ the curve appear linear and the device begin to conduct and turns 'ON' Also the drain current is controlled by the gate voltage.
The almost vertical part of the graph is the ohmic region and the almost horizontal parts are the active region. It is equivalent to a resistor. when biased in the active region it is equivalent to to a current source.
In the cutoff region the gate source voltage is less then the gate threshold voltage and the device is an open circuit or OFF.
In the ohmic region the device acts as a resistor equivalent to $\frac{V_{DS}}{I_D}$. In the saturation region the drain current is a function of gate source voltage.

When the drain voltage is increased the positive drain potential opposes the gate voltage bias and reduces the surface potential in the channel. The channel inversion layer charge decreases with increases drain source voltage and ultimately it become zero when the drain source voltage equals to $(V_{GS} - V_{GS(th)})$. This point the channel pinch-off voltage where the drain current becomes saturated.

Extra: