University of Anbar
College of Engineering
Dept. of Electrical Engineering

Fundumantal of Electronic II

Second Class

Chapter 7 : FET Biasing
Lec07_p3

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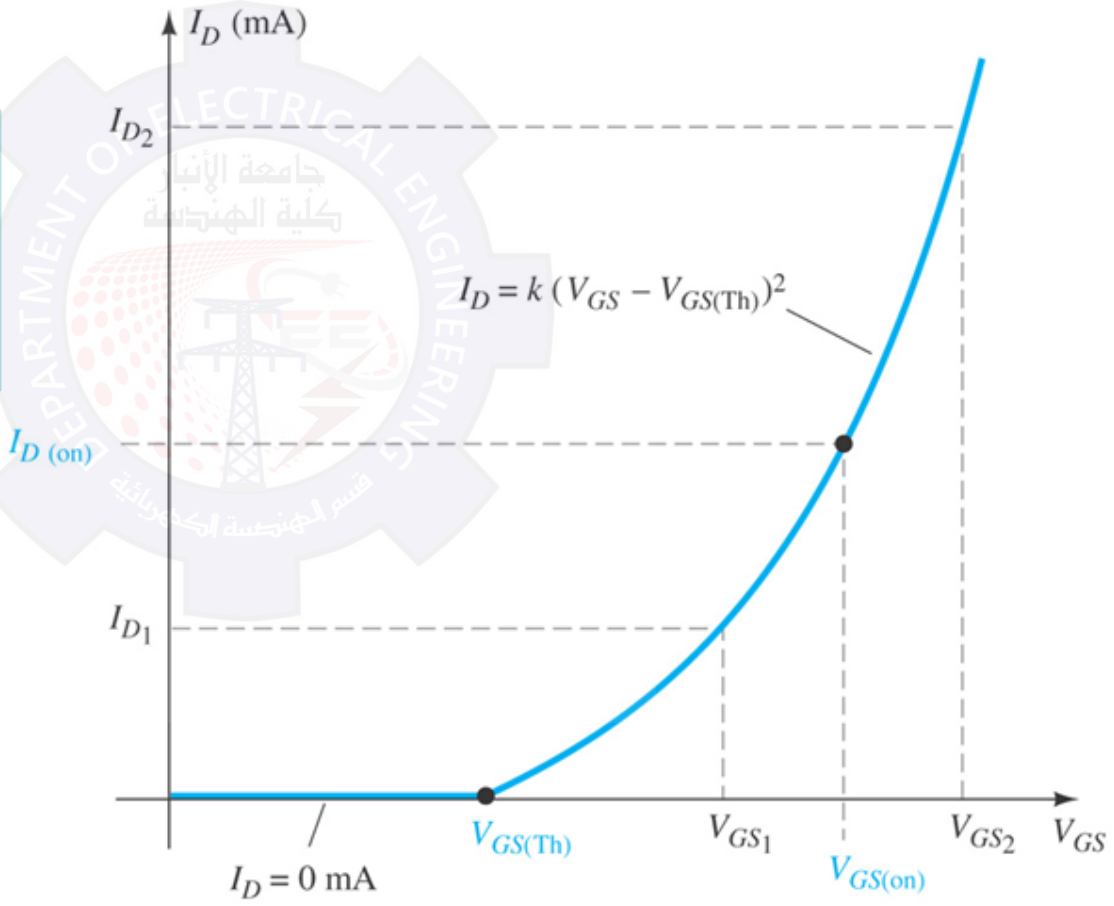
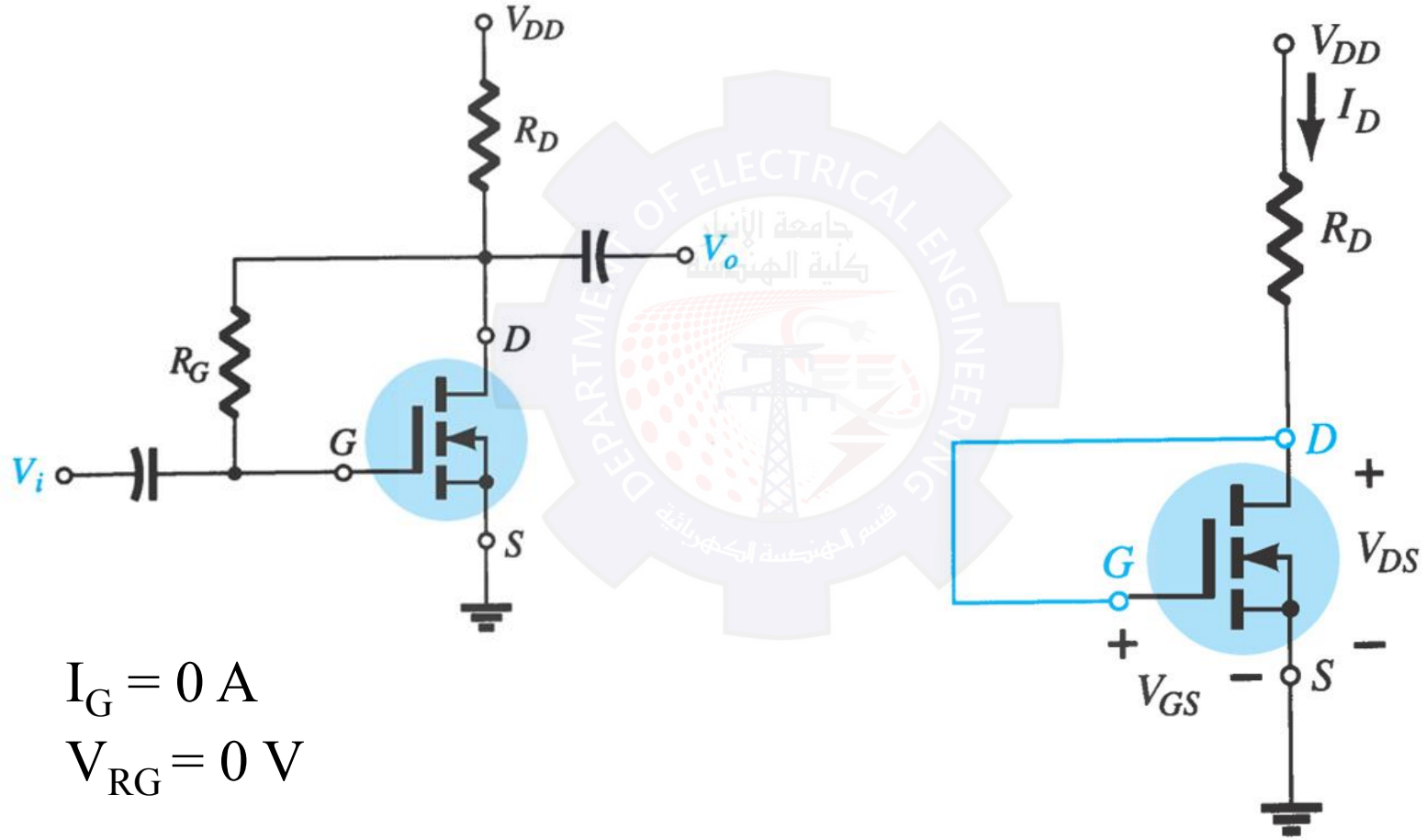
E-Type MOSFET Bias Circuits

The transfer characteristic for the e-type MOSFET is very different from that of a simple JFET or the d-type MOSFET.

$$I_D = k\left(V_{GS} - V_{GS(Th)}\right)^2$$



Feedback Bias Circuit



$I_G = 0\ A$

$V_{RG} = 0\ V$

$V_{DS} = V_{GS}$

$\mathbf{V_{GS} = V_{DD} - I_D R_D}$

DC equivalent of the network

Feedback Bias Q-Point

Step 1

Plot the line using

- $V_{GS} = V_{DD}$, $I_D = 0$ A
- $I_D = V_{DD} / R_D$, $V_{GS} = 0$ V

Step 2

Using values from the specification sheet, plot the transfer curve with

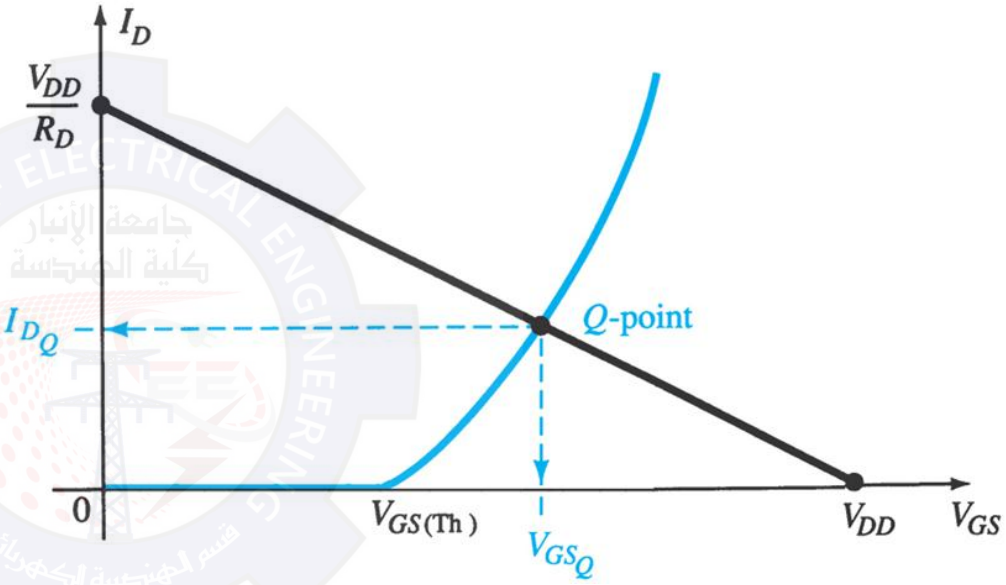
- V_{GSTh} , $I_D = 0$ A
- $V_{GS(on)}$, $I_{D(on)}$

Step 3

The Q-point is located where the line and the transfer curve intersect

Step 4

Using the value of I_D at the Q-point, solve for the other variables in the bias circuit.



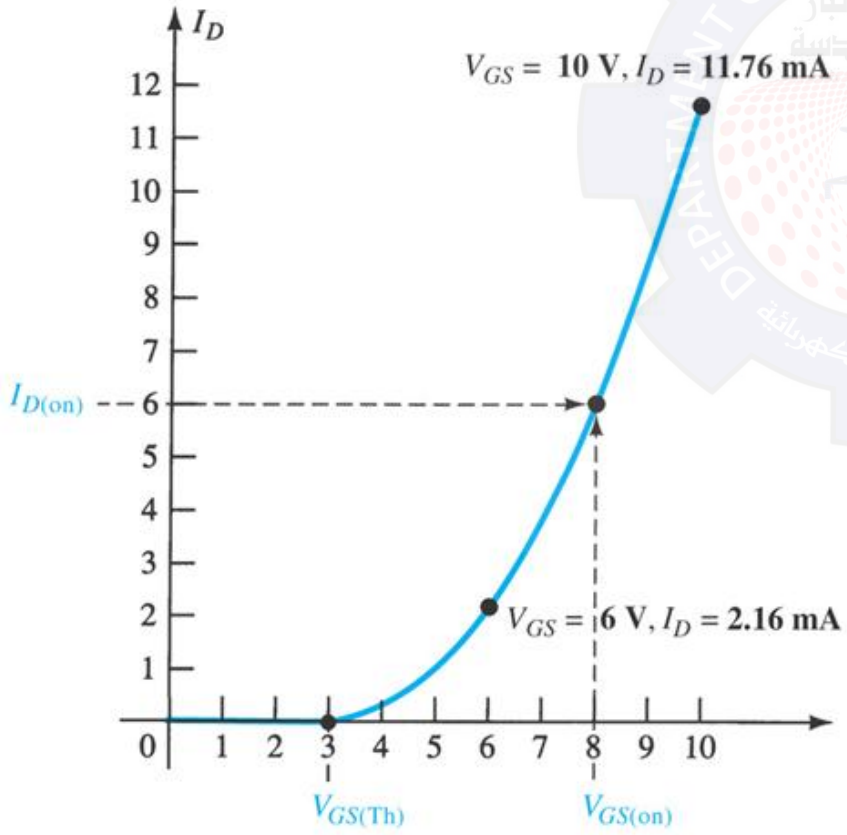
$$V_{GS} = V_{DD} - I_D R_D$$

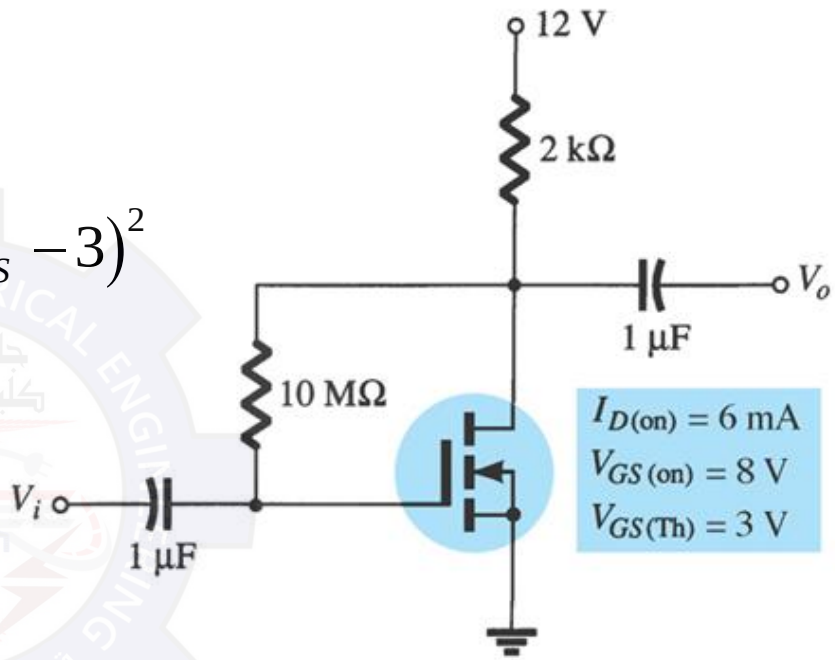
Example 7.11

Find V_{GSQ}, I_{DQ}

Plot Transfer Curve:

$$I_D = k\left(V_{GS} - V_{GS(Th)}\right)^2 = 0.24\times10^{-3}\left(V_{GS} - 3\right)^2$$





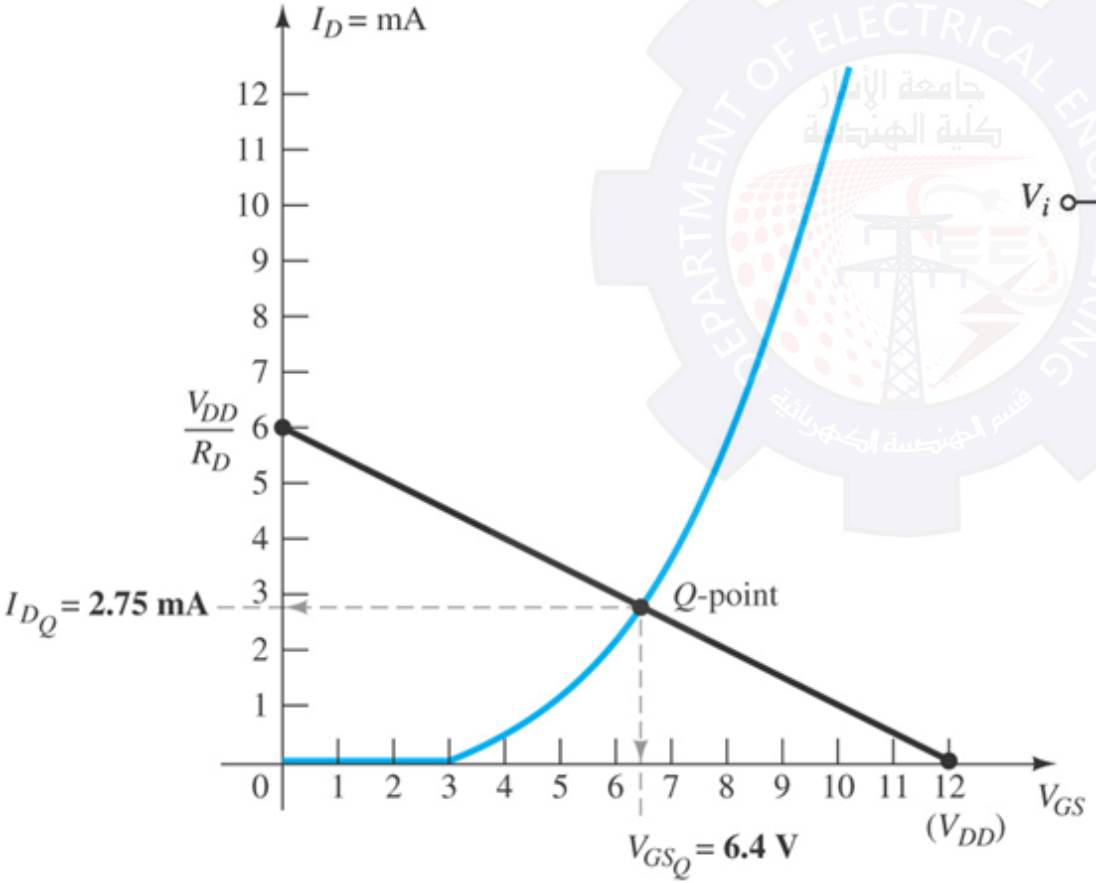
$$k = \frac{I_{D(on)}}{\left(V_{GS(on)} - V_{GS(Th)}\right)^2}$$

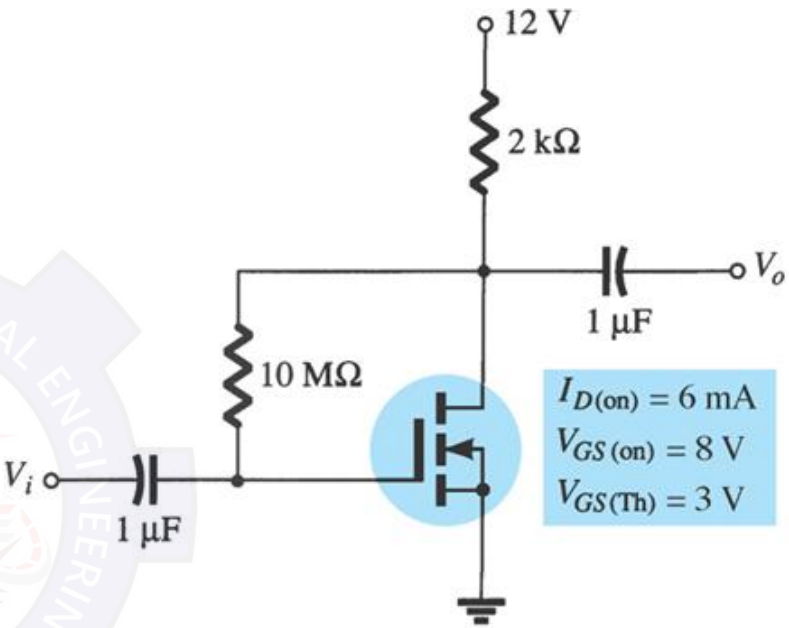
$$k = \frac{6mA}{\left(8 - \quad\right)^2} = 0.24\times10^{-3}$$

Example 7.11 - solution

Plot the line : $V_{GS} = V_{DD} - I_D R_D$

$V_{GS} = 12 - I_D(2k)$





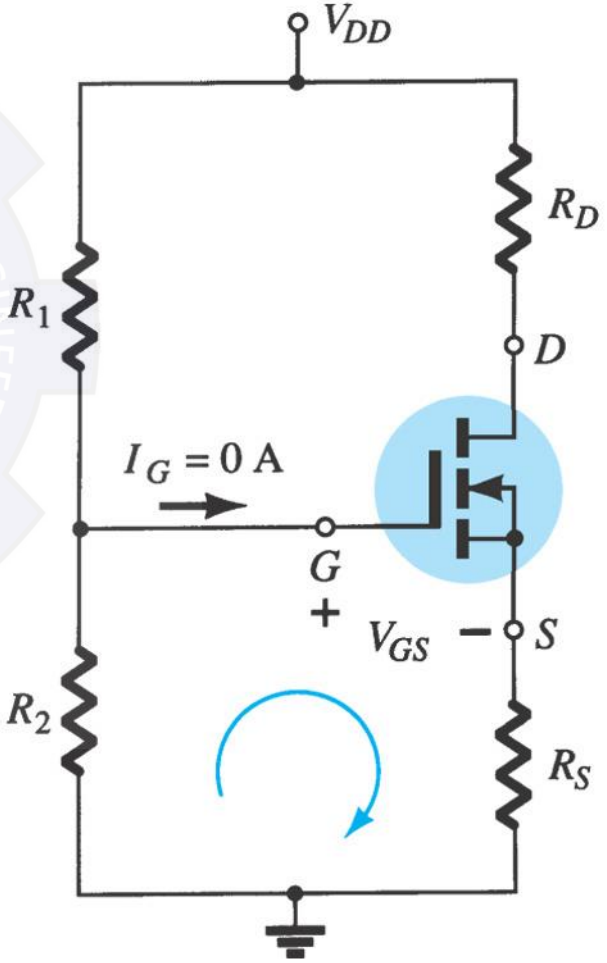
Voltage-Divider Biasing

Plot the line and the transfer curve to find the Q-point. Use these equations:

$$V_G = \frac{R_2 V_{DD}}{R_1 + R_2}$$

$$V_{GS} = V_G - I_D R_S$$

$$V_{DS} = V_{DD} - I_D(R_S + R_D)$$



Example 7.12

Find V_{GSQ}, I_{DQ}

$$k = \frac{I_{D(on)}}{\left(V_{GS(on)} - V_{GS(Th)}\right)^2}$$

$$k = \frac{3mA}{(10-5)^2} = 0.12\times10^{-3}$$

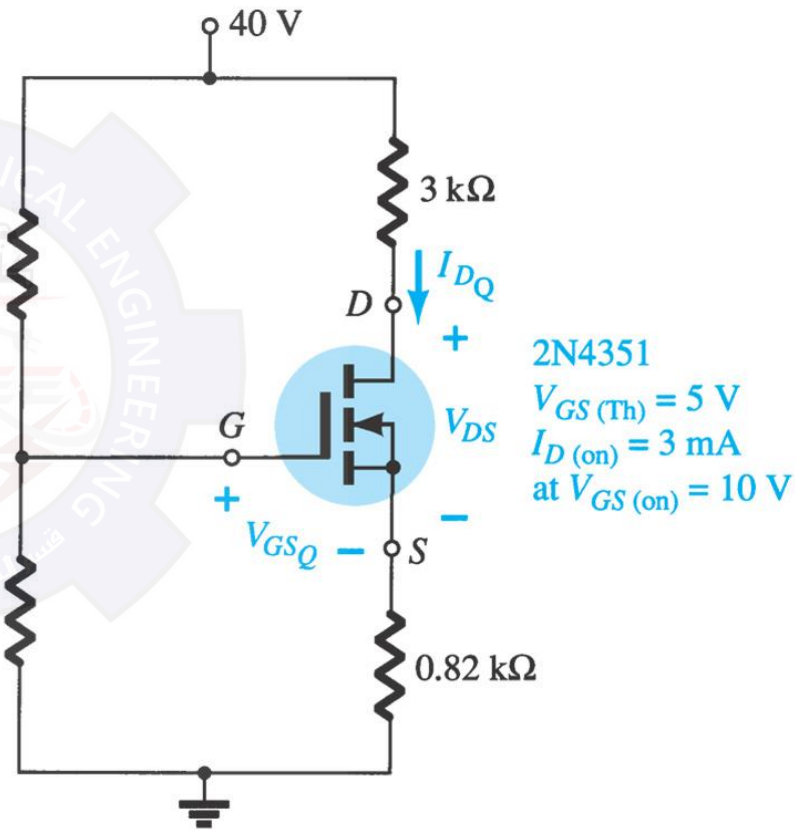
$$I_D = k\left(V_{GS} - V_{GS(Th}\right)^2$$

$$\boxed{I_D = 0.12\times10^{-3}\left(\ _{GS} - 5\right)^2}$$

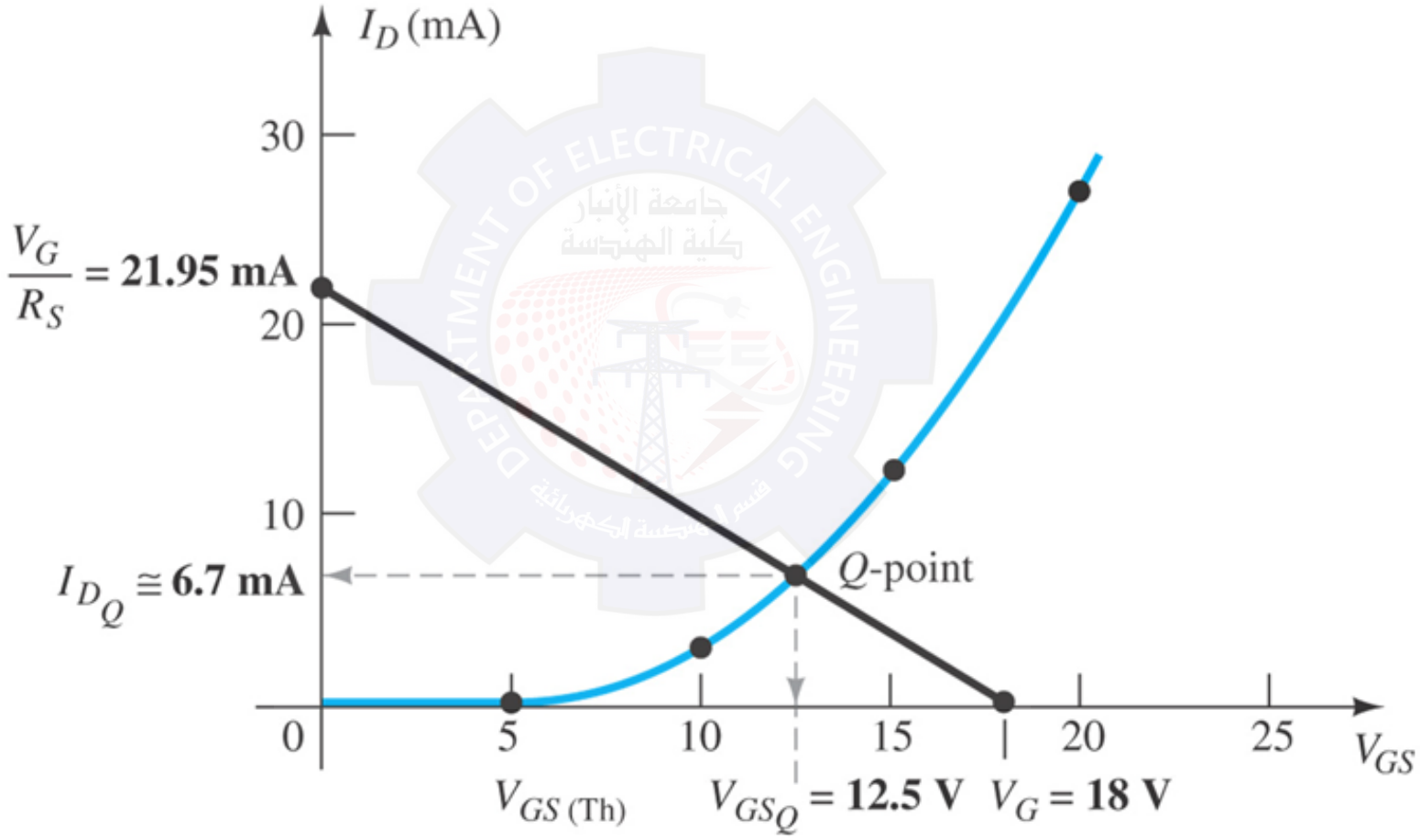
$$V_G \quad \frac{18M\ (40V\ )}{22M\ +18M} = 18V$$

$$V_{GS} = V_G \quad I_D R_S$$

$$\boxed{V_{GS} = 18V\ - I_D(0.82k\ )}$$



Example 7.12 - Solution



$$I_D = 0.12\times10^{-3}\left(V_{GS}-5\right)^2$$

$$V_{GS} = 18V - I_D(0.82k)$$