Muhammad Ali reg.no:19pwcse1801 sec:A

Question No 1

Solution:-

$$I_B = 40\mu A$$

And, given in figure

$$V_{CE} = 4V$$

a) $\beta_{dc} = \frac{I_c}{I_B}$

We have to find $I_c = \frac{V_{cc}}{R_c}$

but $I_c \approx I_E = 4mA$

$$\beta_{dc} = \frac{4mA}{40\mu A}$$

$$\beta_{dc} = 0.1 \times 10^3$$

$$\beta_{dc} = 100$$

b) $\alpha_{dc} = \frac{I_c}{I_E} = \frac{4mA}{4.28mA} \approx 0.99$

c) $\boxed{I_E = 0.004A}$

Day: M T W

Muhammad Ali

Reg. No 19PWCSE 1801

Question No 2

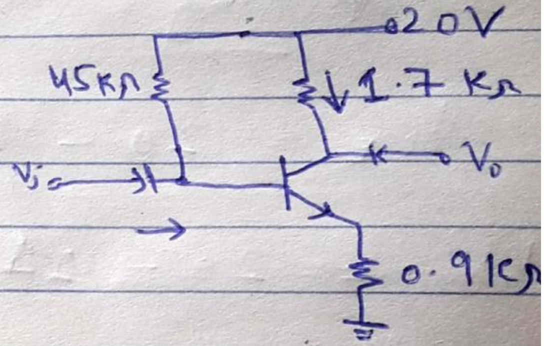
$R_B = 45\,k\Omega$

$R_C = 1.7\,k\Omega$

$R_E = 0.9\,k\Omega$

$\beta = 140$

a) $I_B = ?$



We know that

$$I_B = \frac{V_{CC} - V_{BE}}{R_B + (\beta+1) R_E}$$

Putting values

$$I = \frac{20 - 0.7}{45K + (140+1)(0.9K)}$$

$$I_B = \frac{19.3}{171900}$$

$$\boxed{I_B = 112.4\,\mu A}$$

b) $I_c = \beta I_B$

$I_c = (140)(112.4\ \mu A)$

$\boxed{I_c = 0.015A}$

c) $V_{CE} = V_{CC} - I_c(R_c + R_E)$

putting values

$V_{CE} = 20 - 112.4\ \mu A\,(1.7k\Omega + 0.9k)$

$V_{CE} = 20 - 112.\ \mu A\,(2600)$

$V_{CB} = 20 - 0.296$

$\boxed{V_{CE} = 19.7V}$

d) $V_c = V_{cc} - I_c R_c$

$= 20 - 112.\ \mu A\,(1.7k)$

$= 20 - 0.193$

$\boxed{V_{C} = 19.8}$

e) $V_E = I_E R_E$

$V_E = I_c R_E$ $\quad \because I_c \approx I_E$

$V_E = 112.4\ \mu A\,(0.9k)$

$\boxed{V_E = 0.100V}$

Question No 3

$R_B = 0\,\Omega$

$R_C = 2\,\Omega$

$R_E = 3\,\Omega$

a) $r_e = \dfrac{26\,mV}{I_E}$

we first find I_E

$I_E = (\beta + 1)\, I_B$

$I_E = (1\cancel{2}0 + 1)(112 \cdot \times 10^{-6})$

$I_E = (141)(112 \times 10^{-6})$

$I_E = 0.015\ A$

So,

$r_e = \dfrac{26\,mV}{0.015\,A}$

$\boxed{r_e = 1.65\,\Omega}$

b) $Z_i = ?$

$Z_i = R_B \,||\, \beta(r_e + R_E) \longrightarrow A$

$\beta(r_e + R_E) = 140(1.65 + 0.9k)$

$= 140(901.65)$

$$\beta(r_e + R_E) = 140(901.65)$$

$$\beta(r_e + R_E) = 126231\,\Omega$$

Put in eq (A)

$$Z_i = 45\,k\Omega \parallel 126\,k\Omega$$

$$Z_i = \frac{(45\,k\Omega)(126\,k\Omega)}{(45 + 126)\times 10^3}$$

$$\boxed{Z_i = 33\,k\Omega}$$

c) $\boxed{Z_o = R_C = 1.7\,k\Omega}$

d) $A_v = \dfrac{V_o}{V_i}$

$$A_v = \frac{V_o}{V_i} = \frac{\beta R_C}{126\,k\Omega}$$

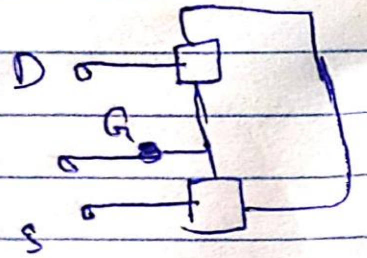
$$A_v = \frac{(140)(1.7\,k\Omega)}{126\,k\Omega} = \frac{196\,k\Omega}{126\,k\Omega}$$

$$\boxed{A_v = 1.5555}$$

Question No 4

Solution :-

The contruction of p-channel of MOSFET is

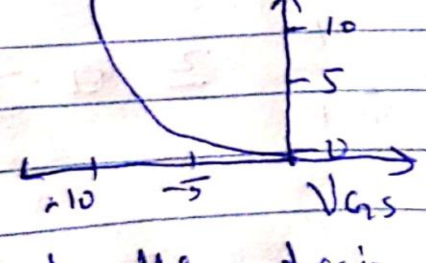


Whenever V_{GS} in enhanced from threshold level, the free carris will in increased in drain,

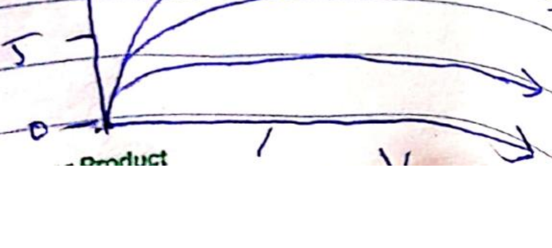
After applying KVL on MOSFET

$$V_{DG} = V_{DS} - V_{GS}$$

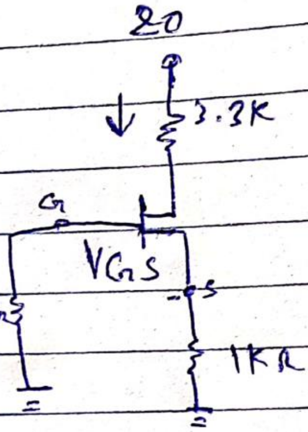
And the V_{GS} will be



And the drain characteristic is



Question No 5



$V_P(V) = -11\ V$

$I_{DSS} = 10\ mA$

a) $V_{GS} = ?$

$V_{GS} = -I_D R_S$ is

the gate to source voltage

So, $I_D = I_{DSS}/4$

$V_{GS} = -\left(\frac{10}{4}\right) mA\ (1K\Omega)$

$V_{GSQ} = -(2.5)(1)$

$\boxed{V_{GS} = -2.5\ V}$

b) $I_{DQ} = 2.5V/1K\Omega = 2.5mA$

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

$= 20V - (2.5mA)(1K\Omega + 3.3K)$

$= 20V - 10.75$

$\boxed{V_{DS} = 9.25}$

d) $V_C = I_D R_S = (2.5mA)(1.K\Omega)$

$\boxed{V_C = 2.5V}$

e) $\boxed{V_{eq} = 0V}$