Sir Syed University of Engineering & Technology (SSUET)

Computer Engineering Department

Course Name: Basic Electronics

Semester: Spring 2011, 3rd

Batch: 2010(Sections: A,B)

Assignments # 1

Course Responsible

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SIR SYED UNIVERSITY OF ENGINEERING AND TECHNOLOGY
COMPUTER ENGINEERING DEPARTMENT
BASIC ELECTRONICS
2010 BATCH (Sections: A, B)
Last Submission Date: 3rd MARCH, 2011, 4PM.

Assignment #1

1. Load Line Analysis: Q1 – to – Q4

Q1.

1. The load line will intersect at $I_D = \frac{E}{R} = \frac{8V}{330\Omega} = 24.24mA$ and $V_D = 8V$.

(a) $V_{D_Q} \cong 0.92V$

$I_{D_Q} \cong 21.5mA$

$V_R = E - V_{D_Q} = 8V - 0.92V = 7.08V$

(b) $V_{D_Q} = 0.7V$

$I_{D_Q} \cong 22.2mA$

$V_R = E - V_{D_Q} = 8V - 0.7V = 7.3V$

(c) $V_{D_Q} = 0V$

$I_{D_Q} = 24.24mA$

$V_R = E - V_{D_Q} = 8V - 0V = 8V$

For (a) + (b) levels of V_{D_Q} and I_{D_Q} are quite close. Levels of part (c) are reasonably close but as expected due to level of applied voltage E.

Q2.

2. (a) $I_D = \frac{E}{R} = \frac{5V}{2.2k\Omega} = 2.27mA$

The load line extends from $I_D = 2.27mA$ to $V_D = 5V$.

$V_{D_Q} \cong \underline{0.7V}$, $I_{D_Q} \cong \underline{2mA}$

(b) $I_D = \frac{E}{R} = \frac{5V}{0.47k\Omega} = 10.64mA$

The load line extends from $I_D = 10.64mA$ to $V_D = 5V$.

$V_{D_Q} \cong \underline{0.8V}$, $I_{D_Q} \cong \underline{9mA}$

(c) $I_D = \frac{E}{R} = \frac{5V}{0.18k\Omega} = 27.78mA$

The load line extends from $I_D = 27.78mA$ to $V_D = 5V$.

$V_{D_Q} \cong \underline{0.93V}$, $I_{D_Q} \cong \underline{22.5mA}$

The resulting values of V_{D_Q} are quite close while I_{D_Q} extends from 2mA to 22.5mA.

Q3.

3. Load line through $I_{D_Q} = 10mA$ of characteristics and $V_D = 7V$ will intersect I_D axis at 11.25mA.

$$I_D = 11.25mA = \frac{E}{R} = \frac{7V}{R}$$

$$\text{with } R = \frac{7V}{11.25mA} = \underline{0.62k\Omega}$$

Q4.

4. (a) $I_D = I_R = \frac{E - V_D}{R} = \frac{30V - 0.7V}{2.2k\Omega} = \underline{13.32mA}$

$V_D = \underline{0.7V}$, $V_R = E - V_D = 30V - 0.7V = \underline{29.3V}$

(b) $I_D = \frac{E - V_D}{R} = \frac{30V - 0V}{2.2k\Omega} = \underline{13.64mA}$

$V_D = \underline{0V}$, $V_R = \underline{30V}$

Yes, since $E \gg V_T$ the levels of I_D and V_R are quite close.