PART IIA 2006 3B2 NUMERICAL ANSWERS

1. $t_{rise} = \frac{1.6\,C_L}{k} = 0.8\mu S$

3. (a)

$$D_1 = \overline{X_1}\cdot X_2 + X_1\cdot\overline{X_2} + \overline{X_1}\cdot Q_1 + Q_1\cdot\overline{X_2}$$

$$D_2 = \overline{X_1}\cdot X_2 + X_1\cdot\overline{X_2} + \overline{X_1}\cdot\overline{Q_1} + \overline{Q_1}\cdot\overline{X_2}$$

3. (b) This is a usual counter that counts in a decimal sequence 0-1-2-3-4-5. The counter will then stay at 5 and the LED lit. The NAND gate should sink 11 mA.

4. Multiplexer

$$\begin{aligned} D_{out} = {} & \overline{S_0}\,\overline{S_1}\,\overline{S_2}D_0 + S_0\overline{S_1}\,\overline{S_2}D_1 + \\ & \overline{S_0}S_1\overline{S_2}D_2 + S_0S_1\overline{S_2}D_3 + \\ & \overline{S_0}\,\overline{S_1}S_2D_4 + S_0\overline{S_1}S_2D_5 + \\ & \overline{S_0}S_1S_2D_6 + S_0S_1S_2D_7 \end{aligned}$$

4 (b) A= $\overline{S_1}$, E= $\overline{S_2}$, B=S_1, C= $\overline{S_1}$, D= S_1, F= S_2

4 (c)

$I_0 = D_0 = \overline{D}$ $\quad S_0 = A$

$I_1 = 0$ $\quad S_1 = B$

$I_2 = \overline{D}$ $\quad S_2 = C$

$I_3 = 0$ $\quad T = D_{out}$

$I_4 = \overline{D}$

$I_5 = D$

$I_6 = D$

$I_7 = D$