Name:	**Dr JBO**
Student ID Number:	**Model Answer**
Section:	01A / 01B / 02A / 02B
Lecturer:	Dr. Jamaludin Bin Omar

EEEB273 - Quiz 2 [Question Set 1]
SEMESTER 1, ACADEMIC YEAR 2013/2014
Date: 8 July 2013 Time: 15 minutes

Question:

Study **Figure 1** carefully. Assume $\beta = 30$, $V_{BE}(on) = 0.7$ V, and $V_A = \infty$ for all BJTs in the circuit. For $R_C = 2$ kΩ and $v_{B1} = v_{B2} = 0$ V, **determine** the value of R_1 such that $V_{CE1} = 2.5$ V. Write your answers as precise as possible, in 4 decimal points, with proper Units for the parameters.

[10 marks]

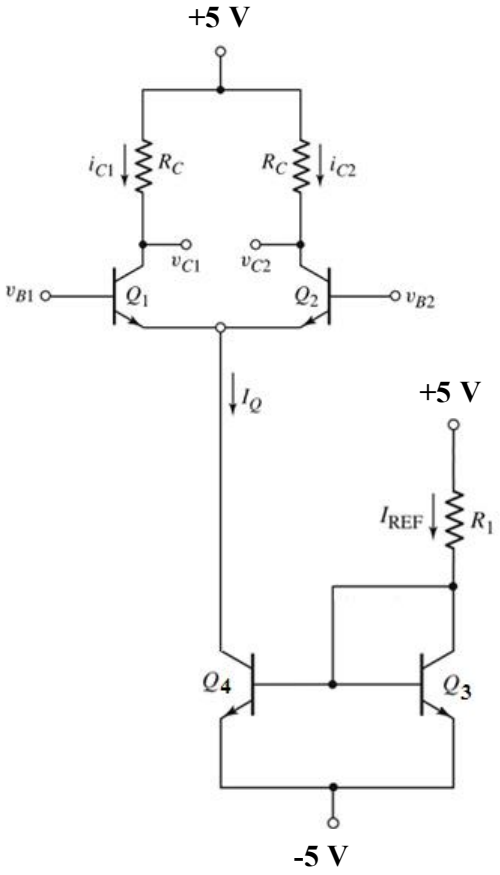

Figure 1

v_{C1} $= v_{B1} - V_{BE1}(on) + V_{CE1}$ [1]
$= 0 - 0.7 + 2.5$ $= 1.8$ V [1]

v_{C1} $= 5 - i_{C1} R_C$
i_{C1} $= (5 - v_{C1}) / R_C$ [1]
$= (5 - 1.8) / 2k$ $= 1.6$ mA [1]

When $v_{B1} = v_{B2} = 0$ V:
i_{C2} $= i_{C1}$ [1]
I_Q $= i_{C1} + i_{C2}$ $= 3.2$ mA [1]

I_{REF} $= I_Q (1+2/\beta)$ [1]
$= (3.2m)(1 + 2/30)$ $= 3.4133$ mA [1]

R_1 $= (V^+ - V_{BE3}(on) - V^-) / (I_{REF})$ [1]
$= (5-0.7-(-5)) / (3.4133\ m) = 2.7246$ kΩ [1]

$$g_m = \frac{I_{CQ}}{V_T}$$

$$r_o = \frac{V_A}{I_{CQ}}$$

Answer:

Name:	**Dr JBO**
Student ID Number:	**Model Answer**
Section:	01A / 01B / 02A / 02B
Lecturer:	Dr. Jamaludin Bin Omar

EEEB273 - Quiz 2 [Question Set 2]
SEMESTER 1, ACADEMIC YEAR 2013/2014
Date: 8 July 2013 Time: 15 minutes

Question:

Study **Figure 1** carefully. Assume $\beta = 40$, $V_{BE}(on) = 0.7$ V, and $V_A = \infty$ for all BJTs in the circuit. For $R_C = 2$ kΩ and $v_{B1} = v_{B2} = 0$ V, **determine** the value of R_1 such that $V_{CE1} = 2.5$ V. Write your answers as precise as possible, in 4 decimal points, with proper Units for the parameters.

[10 marks]

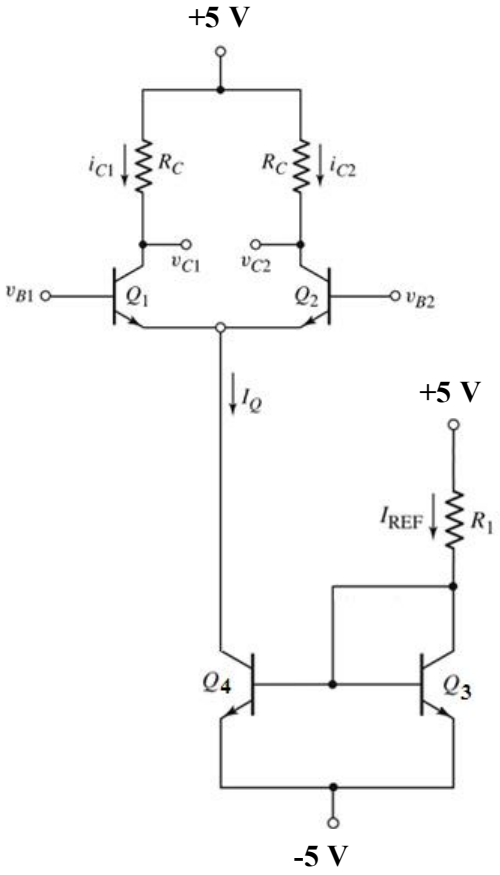

Figure 1

v_{C1} $= v_{B1} - V_{BE1}(on) + V_{CE1}$ [1]
$= 0 - 0.7 + 2.5$ $= 1.8$ V [1]

v_{C1} $= 5 - i_{C1} R_C$
i_{C1} $= (5 - v_{C1}) / R_C$ [1]
$= (5 - 1.8) / 2k$ $= 1.6$ mA [1]

When $v_{B1} = v_{B2} = 0$ V:
i_{C2} $= i_{C1}$ [1]
I_Q $= i_{C1} + i_{C2}$ $= 3.2$ mA [1]

I_{REF} $= I_Q (1+2/\beta)$ [1]
$= (3.2m)(1 + 2/40)$ $= 3.36$ mA [1]

R_1 $= (V^+ - V_{BE3}(on) - V^-) / (I_{REF})$ [1]
$= (5-0.7-(-5)) / (3.36\ m) = 2.7678$ kΩ [1]

$$g_m = \frac{I_{CQ}}{V_T}$$

$$r_o = \frac{V_A}{I_{CQ}}$$

Answer:

Name:	**Dr JBO**
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Section:	01A / 01B / 02A / 02B
Lecturer:	Dr. Jamaludin Bin Omar

EEEB273 - Quiz 2 [Question Set 3]
SEMESTER 1, ACADEMIC YEAR 2013/2014
Date: 8 July 2013 Time: 15 minutes

Question:

Study **Figure 1** carefully. Assume $\beta = 40$, $V_{BE}(on) = 0.7$ V, and $V_A = \infty$ for all BJTs in the circuit. For $R_C = 2.5$ kΩ and $v_{B1} = v_{B2} = 0$ V, **determine** the value of R_1 such that $V_{CE1} = 2$ V. Write your answers as precise as possible, in 4 decimal points, with proper Units for the parameters.

[10 marks]

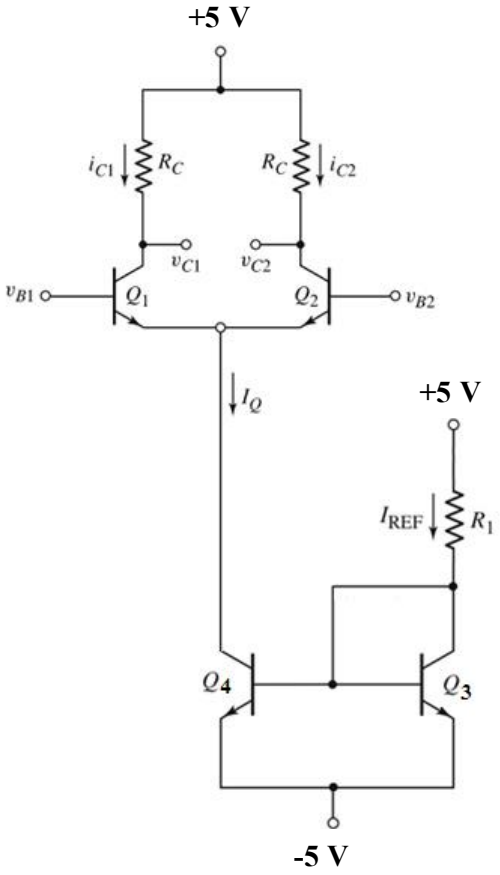

Figure 1

v_{C1} $= v_{B1} - V_{BE1}(on) + V_{CE1}$ [1]
$= 0 - 0.7 + 2$ $= 1.3$ V [1]

v_{C1} $= 5 - i_{C1} R_C$
i_{C1} $= (5 - v_{C1}) / R_C$ [1]
$= (5 - 1.3) / 2.5k$ $= 1.48$ mA [1]

When $v_{B1} = v_{B2} = 0$ V:
i_{C2} $= i_{C1}$ [1]
I_Q $= i_{C1} + i_{C2}$ $= 2.96$ mA [1]

I_{REF} $= I_Q (1+2/\beta)$ [1]
$= (2.96m)(1 + 2/40)$ $= 3.108$ mA [1]

R_1 $= (V^+ - V_{BE3}(on) - V^-) / (I_{REF})$ [1]
$= (5-0.7-(-5)) / (3.108\ m) = 2.9922$ kΩ [1]

$$g_m = \frac{I_{CQ}}{V_T}$$

$$r_o = \frac{V_A}{I_{CQ}}$$

Answer:

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Section:	01A / 01B / 02A / 02B
Lecturer:	Dr. Jamaludin Bin Omar

EEEB273 - Quiz 2 [Question Set 4]
SEMESTER 1, ACADEMIC YEAR 2013/2014
Date: 8 July 2013 Time: 15 minutes

Question:

Study **Figure 1** carefully. Assume $\beta = 30$, $V_{BE}(on) = 0.7$ V, and $V_A = \infty$ for all BJTs in the circuit. For $R_C = 2.5$ kΩ and $v_{B1} = v_{B2} = 0$ V, **determine** the value of R_1 such that $V_{CE1} = 2$ V. Write your answers as precise as possible, in 4 decimal points, with proper Units for the parameters.

[10 marks]

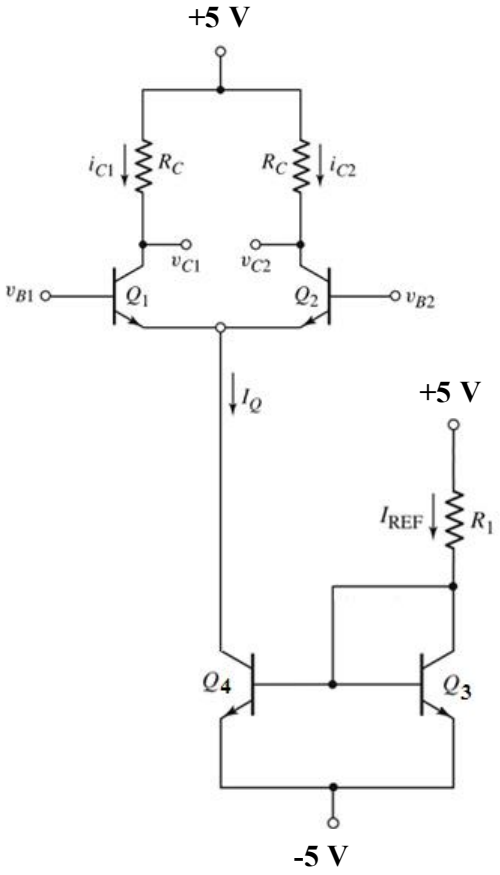

Figure 1

v_{C1} $= v_{B1} - V_{BE1}(on) + V_{CE1}$ [1]
$= 0 - 0.7 + 2$ $= 1.3$ V [1]

v_{C1} $= 5 - i_{C1} R_C$
i_{C1} $= (5 - v_{C1}) / R_C$ [1]
$= (5 - 1.3) / 2.5k$ $= 1.48$ mA [1]

When $v_{B1} = v_{B2} = 0$ V:
i_{C2} $= i_{C1}$ [1]
I_Q $= i_{C1} + i_{C2}$ $= 2.96$ mA [1]

I_{REF} $= I_Q (1+2/\beta)$ [1]
$= (2.96m)(1 + 2/30)$ $= 3.1573$ mA [1]

R_1 $= (V^+ - V_{BE3}(on) - V^-) / (I_{REF})$ [1]
$= (5-0.7-(-5)) / (3.1573\ m) = 2.9455$ kΩ [1]

$$g_m = \frac{I_{CQ}}{V_T}$$

$$r_o = \frac{V_A}{I_{CQ}}$$

Answer: