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

EEEB273 - Quiz 5 [Question Set 1]
SEMESTER 2, ACADEMIC YEAR 2011/2012
Date: 30 November 2011

Question:

A **class-A** emitter follower biased with a constant-current source is shown in **Figure 1**. Study **Figure 1** carefully. The transistor parameters are: β **= 180,** V_{BE} **= 0.7 V,** and V_{CE}**(sat) = 0.2V**. Neglecting base currents:

(i) **Find** the value of I_Q.

[3 marks]

(ii) **Determine** the value of R that will produce the maximum possible output signal swing.

[3 marks]

(iii) **Calculate** the power conversion efficiency. Consider all power delivered to all transistors.

[4 marks]

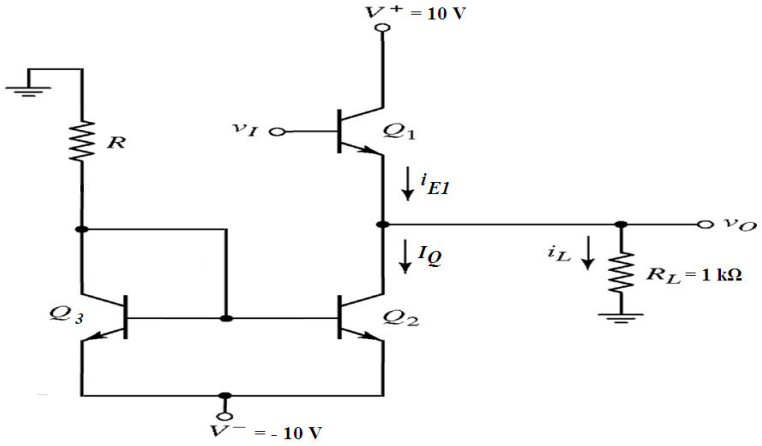

Figure 1

Answer: (You may continue writing your answer in the next page)

(i) v_O**(max) =** V^+ **–** V_{CE}**(sat) = 10 – 0.2 = 9.8 V**
$I_Q = i_L$**(max) =** v_O**(max) /** R_L **= 9.8 / 1k = 9.8 mA**

(ii) $R = (0 - V_{BE} - (-10)) / I_Q = 9.3 / 9.8\text{m} = 949\ \Omega$

(iii)

$$\overline{P}_L = \frac{1}{2}(i_L(\text{max}))^2 R_L = \frac{1}{2}(9.8\text{m})^2(1\text{k})$$

$$\Rightarrow \overline{P}_L = 48.02\text{mW}$$

$$\overline{P}_S = I_Q(V^+ - V^-) + I_Q(0 - V^-)$$

$$\Rightarrow \overline{P}_S = 9.8\text{m}(20) + 9.8\text{m}(10) = 294\text{mW}$$

$$\eta = \frac{\overline{P}_L}{\overline{P}_S} = \frac{48.02\text{m}}{294\text{m}} = 16.3\%$$

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

EEEB273 - Quiz 5 [Question Set 2]
SEMESTER 2, ACADEMIC YEAR 2011/2012
Date: 30 November 2011

Question:

A **class-A** emitter follower biased with a constant-current source is shown in **Figure 1**. Study **Figure 1** carefully. The transistor parameters are: β **= 190,** V_{BE} **= 0.7 V,** and V_{CE}**(sat) = 0.2V**. Neglecting base currents:

(i) **Find** the value of I_Q.

[3 marks]

(ii) **Determine** the value of R that will produce the maximum possible output signal swing.

[3 marks]

(iii) **Calculate** the power conversion efficiency. Consider all power delivered to all transistors.

[4 marks]

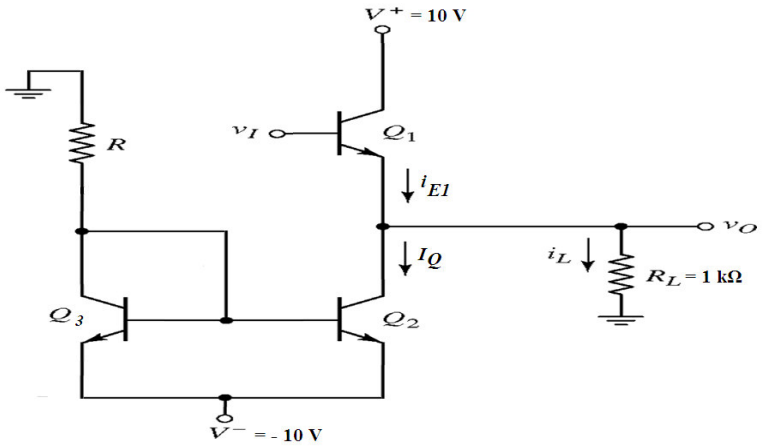

Figure 1

Answer: (You may continue writing your answer in the next page)

(i) v_O**(max) =** V^+ **–** V_{CE}**(sat) = 10 – 0.2 = 9.8 V**
$I_Q = i_L$**(max) =** v_O**(max) /** R_L **= 9.8 / 1k = 9.8 mA**

(ii) $R = (0 - V_{BE} - (-10)) / I_Q = 9.3 / 9.8\text{m} = 949\ \Omega$

(iii)

$$\overline{P}_L = \frac{1}{2}(i_L(\text{max}))^2 R_L = \frac{1}{2}(9.8\text{m})^2(1\text{k})$$

$$\Rightarrow \overline{P}_L = 48.02\text{mW}$$

$$\overline{P}_S = I_Q(V^+ - V^-) + I_Q(0 - V^-)$$

$$\Rightarrow \overline{P}_S = 9.8\text{m}(20) + 9.8\text{m}(10) = 294\text{mW}$$

$$\eta = \frac{\overline{P}_L}{\overline{P}_S} = \frac{48.02\text{m}}{294\text{m}} = 16.3\%$$

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

EEEB273 - Quiz 5 [Question Set 3]
SEMESTER 2, ACADEMIC YEAR 2011/2012
Date: 30 November 2011

Question:

A **class-A** emitter follower biased with a constant-current source is shown in **Figure 1**. Study **Figure 1** carefully. The transistor parameters are: β **= 180,** V_{BE} **= 0.6 V,** and V_{CE}**(sat) = 0.2V**. Neglecting base currents:

(i) **Find** the value of I_Q.

[3 marks]

(ii) **Determine** the value of R that will produce the maximum possible output signal swing.

[3 marks]

(iii) **Calculate** the power conversion efficiency. Consider all power delivered to all transistors.

[4 marks]

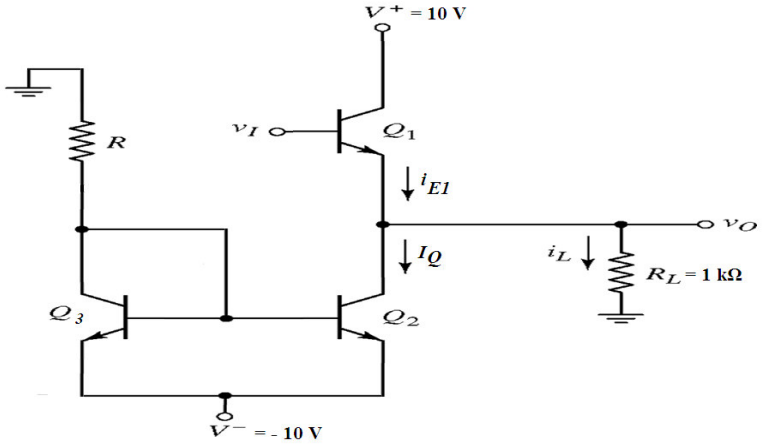

Figure 1

Answer: (You may continue writing your answer in the next page)

(i) v_O**(max) =** V^+ **–** V_{CE}**(sat) = 10 – 0.2 = 9.8 V**
$I_Q = i_L$**(max) =** v_O**(max) /** R_L **= 9.8 / 1k = 9.8 mA**

(ii) $R = (0 - V_{BE} - (-10)) / I_Q = 9.4 / 9.8\text{m} = 959\ \Omega$

(iii)

$$\overline{P}_L = \frac{1}{2}(i_L(\max))^2 R_L = \frac{1}{2}(9.8\text{m})^2(1\text{k})$$

$$\Rightarrow \overline{P}_L = 48.02\text{mW}$$

$$\overline{P}_S = I_Q(V^+ - V^-) + I_Q(0 - V^-)$$

$$\Rightarrow \overline{P}_S = 9.8\text{m}(20) + 9.8\text{m}(10) = 294\text{mW}$$

$$\eta = \frac{\overline{P}_L}{\overline{P}_S} = \frac{48.02\text{m}}{294\text{m}} = 16.3\%$$

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

EEEB273 - Quiz 5 [Question Set 4]
SEMESTER 2, ACADEMIC YEAR 2011/2012
Date: 30 November 2011

Question:

A **class-A** emitter follower biased with a constant-current source is shown in **Figure 1**. Study **Figure 1** carefully. The transistor parameters are: β **= 190,** V_{BE} **= 0.6 V,** and V_{CE}**(sat) = 0.2V**. Neglecting base currents:

(i) **Find** the value of I_Q.

[3 marks]

(ii) **Determine** the value of R that will produce the maximum possible output signal swing.

[3 marks]

(iii) **Calculate** the power conversion efficiency. Consider all power delivered to all transistors.

[4 marks]

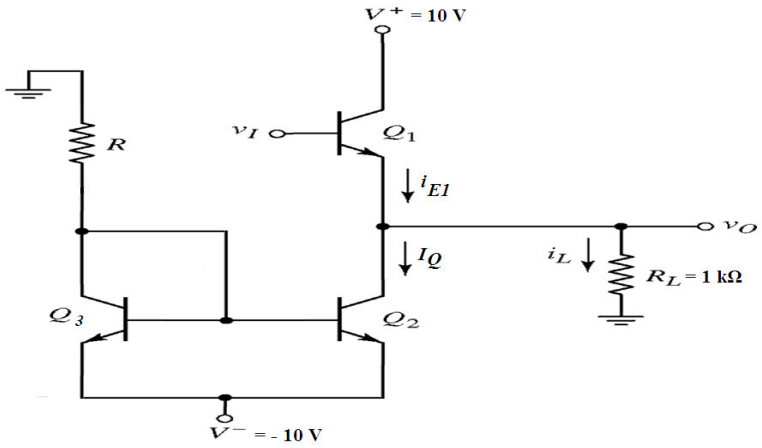

Figure 1

Answer: (You may continue writing your answer in the next page)

(i) v_O**(max) =** V^+ **–** V_{CE}**(sat) = 10 – 0.2 = 9.8 V**
$I_Q = i_L$**(max) =** v_O**(max) /** R_L **= 9.8 / 1k = 9.8 mA**

(ii) $R = (0 - V_{BE} - (-10)) / I_Q = 9.4 / 9.8\text{m} = 959\ \Omega$

(iii)

$$\overline{P}_L = \frac{1}{2}(i_L(\text{max}))^2 R_L = \frac{1}{2}(9.8\text{m})^2(1\text{k})$$

$$\Rightarrow \overline{P}_L = 48.02\text{mW}$$

$$\overline{P}_S = I_Q(V^+ - V^-) + I_Q(0 - V^-)$$

$$\Rightarrow \overline{P}_S = 9.8\text{m}(20) + 9.8\text{m}(10) = 294\text{mW}$$

$$\eta = \frac{\overline{P}_L}{\overline{P}_S} = \frac{48.02\text{m}}{294\text{m}} = 16.3\%$$