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

EEEB273 - Quiz 1 [Question Set 1]
SEMESTER 2, ACADEMIC YEAR 2011/2012
Date: 28 September 2011

**Question:**

Given that matched **pnp transistors** are available with the parameters: $\beta$ **= 100,** $V_{EB}$ **(on) = 0.6 V,** and $V_A$ **= 150 V**. Power supplies used to power the circuit are: $V^+$ **= 7.5 V** and $V^-$ = -7.5 V.

**(a)** **Design** a two-transistor current source to provide a constant current of $I_O$ **= 0.8 mA using the available pnp transistors** mentioned above. [5 marks]

**(b)** **Find** the output resistance ($R_O$) of the two-transistor current source. [2 marks]

**(c)** **Draw** the complete **circuit diagram** for the design of the two-transistor current source. [3 marks]

**Show clearly all calculations.**

**Answer:**

**(a)**

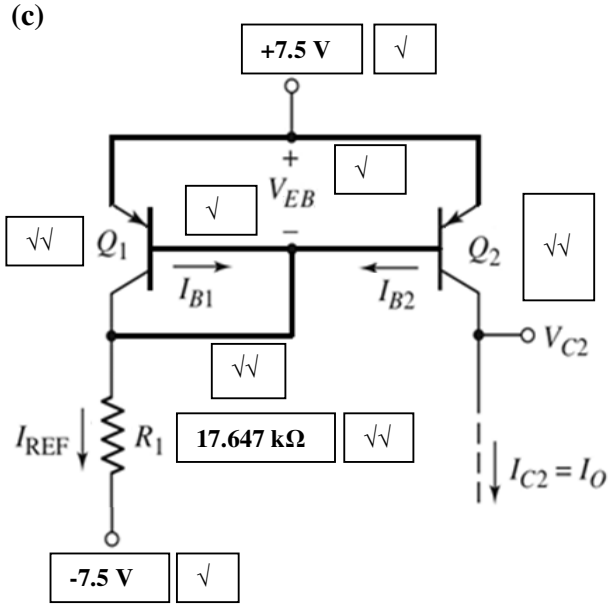
$I_{REF} = I_O (1 + 2/\beta)$ [1]
$= (0.8\text{m})(1 + 2/100)$ [1]
$= 0.816$ mA [0.5]

$R_1 = (V^+ - V_{EB} - V^-) / I_{REF}$ [1]
$= (7.5 - 0.6 - (-7.5)) / (0.816\text{m})$ [1]
$= 17.647$ kΩ [0.5]

**(b)**

$R_O = V_A / I_O$ [1]
$= (150) / (0.8\text{m})$ [0.5]
$= 187.5$ kΩ [0.5]

**(c)**




√ = 0.25 marks

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

EEEB273 - Quiz 1 [Question Set 2]
SEMESTER 2, ACADEMIC YEAR 2011/2012
Date: 28 September 2011

**Question:**

Given that matched **pnp transistors** are available with the parameters: $\beta$ **= 120,** $V_{EB}$ **(on) = 0.6 V**, and $V_A$ **= 150 V**. Power supplies used to power the circuit are: $V^+$ **= 8.5 V** and $V^{--}$ **= -8.5 V**.

**(a) Design** a two-transistor current source to provide a constant current of $I_O$ **= 0.9 mA using the available pnp transistors** mentioned above. [5 marks]

**(b) Find** the output resistance ($R_O$) of the two-transistor current source. [2 marks]

**(c) Draw** the complete **circuit diagram** for the design of the two-transistor current source. [3 marks]

**Show clearly all calculations.**

**Answer:**

**(a)**

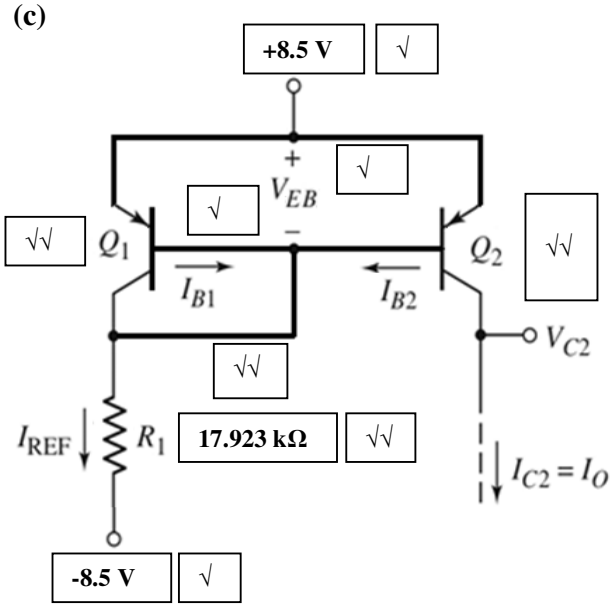
$I_{REF} = I_O (1 + 2/\beta)$ [1]
$= (0.9\text{m})(1 + 2/120)$ [1]
$= 0.915$ mA [0.5]

$R_1 = (V^+ - V_{EB} - V^{--}) / I_{REF}$ [1]
$= (8.5 - 0.6 - (-8.5)) / (0.915\text{m})$ [1]
$= 17.923$ kΩ [0.5]

**(b)**

$R_O = V_A / I_O$ [1]
$= (150) / (0.9\text{m})$ [0.5]
$= 166.7$ kΩ [0.5]

**(c)**




√ = 0.25 marks

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| Student ID Number: | **Model answer** |
| Section: | 01A / 01B |
| Lecturer: | Dr. Jamaludin Bin Omar |

EEEB273 - Quiz 1 [Question Set 3]
SEMESTER 2, ACADEMIC YEAR 2011/2012
Date: 28 September 2011

**Question:**

Given that matched **pnp transistors** are available with the parameters: $\beta$ **= 100,** $V_{EB}$ **(on) = 0.6 V,** and $V_A$ **= 150 V**. Power supplies used to power the circuit are: $V^+$ **= 8.5 V** and $V^{--}$ **= -8.5 V**.

**(a) Design** a two-transistor current source to provide a constant current of $I_O$ **= 1 mA using the available pnp transistors** mentioned above. [5 marks]

**(b) Find** the output resistance ($R_O$) of the two-transistor current source. [2 marks]

**(c) Draw** the complete **circuit diagram** for the design of the two-transistor current source. [3 marks]

**Show clearly all calculations.**

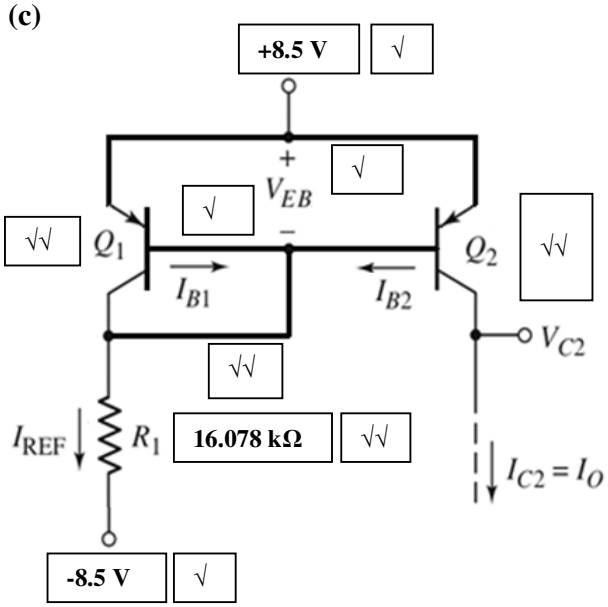
**Answer:**

**(a)** $I_{REF} = I_O (1 + 2/\beta)$ [1]
$= (1.0\text{m})(1 + 2/100)$ [1]
$= 1.020$ mA [0.5]

$R_1 = (V^+ - V_{EB} - V^{--}) / I_{REF}$ [1]
$= (8.5 - 0.6 - (-8.5)) / (1.020\text{m})$ [1]
$= 16.078$ kΩ [0.5]

**(b)** $R_O = V_A / I_O$ [1]
$= (150) / (1.0\text{m})$ [0.5]
$= 150.0$ kΩ [0.5]

**(c)**




√ = 0.25 marks

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| Student ID Number: | **Model answer** |
| Section: | 01A / 01B |
| Lecturer: | Dr. Jamaludin Bin Omar |

EEEB273 - Quiz 1 [Question Set 4]
SEMESTER 2, ACADEMIC YEAR 2011/2012
Date: 28 September 2011

**Question:**

Given that matched **pnp transistors** are available with the parameters: $\beta$ **= 120,** $V_{EB}$ **(on) = 0.6 V**, and $V_A$ **= 140 V**. Power supplies used to power the circuit are: $V^+$ **= 7.5 V** and $V^{--}$ **= -7.5 V**.

**(a) Design** a two-transistor current source to provide a constant current of $I_O$ **= 0.8 mA using the available pnp transistors** mentioned above. [5 marks]

**(b) Find** the output resistance ($R_O$) of the two-transistor current source. [2 marks]

**(c) Draw** the complete **circuit diagram** for the design of the two-transistor current source. [3 marks]

**Show clearly all calculations.**

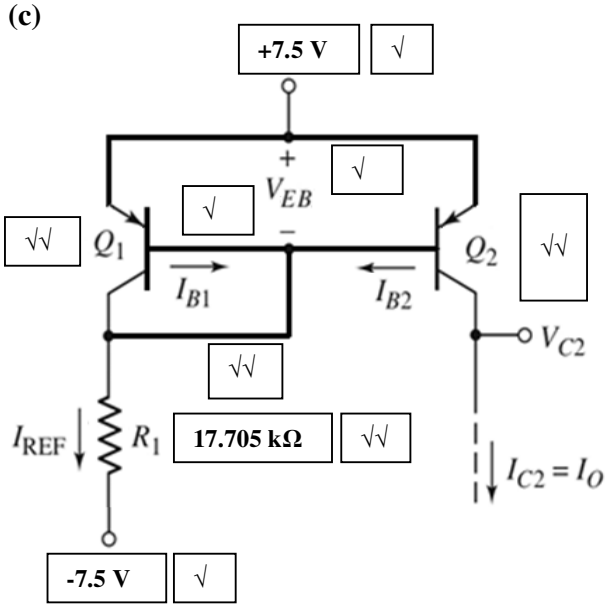
**Answer:**

**(a)** $I_{REF} = I_O (1 + 2/\beta)$ **[1]**
$= (0.8m)(1 + 2/120)$ **[1]**
$= 0.813$ mA **[0.5]**

$R_1 = (V^+ - V_{EB} - V^{--}) / I_{REF}$ **[1]**
$= (7.5 - 0.6 - (-7.5)) / (0.813m)$ **[1]**
$= 17.705$ kΩ **[0.5]**

**(b)** $R_O = V_A / I_O$ **[1]**
$= (140) / (0.8m)$ **[0.5]**
$= 175.0$ kΩ **[0.5]**

**(c)**




√ = 0.25 marks