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 2012/2013
Date: 10 July 2012

Question:

Refer to **Figure 1**. Assume $\beta = 200$ and $V_{BE}(\text{on}) = 0.7$ V for all BJTs in the circuit. For $R_1 = 12$ kΩ and $R_C = 12$ kΩ, find the differential voltage gain (A_d) of the differential amplifier taken as **one-sided output**. [10 marks]

Answer:

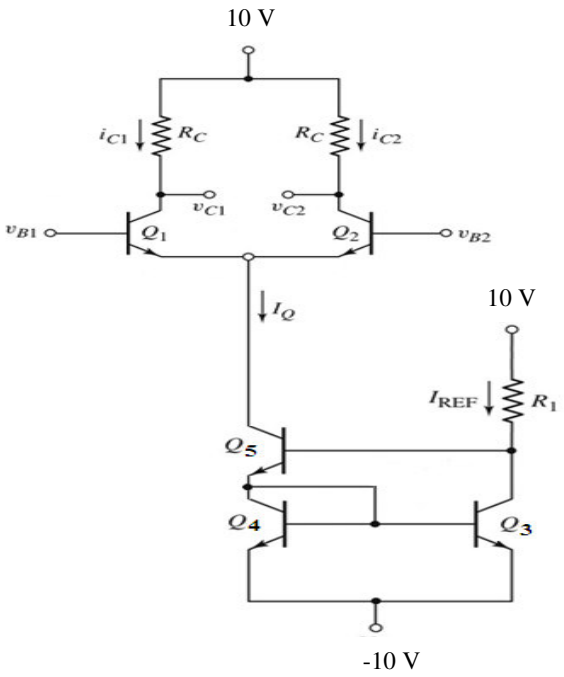

Figure 1

I_{REF} $= (V^+ - V_{BE5} - V_{BE3} - V^-) / (R_1) \approx I_Q$ ($\beta = 200$) **[2 marks]**
$= (10\text{-}0.7\text{-}0.7\text{-}(-10)) / (12\text{k}) = 1.55$ mA **[2 marks]**

A_d $= (g_m R_C)/2 = (I_Q R_C)/(4V_T)$ **[2 marks]**

g_m $= I_Q / (2V_T) = (1.55\text{m})/(2\text{x}26\text{m}) = 29.8077$ mA/V **[2 marks]**

A_d $= (29.8077\text{m})(12\text{k})/(2) = 178.846$ V/V **[2 marks]**

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Lecturer:	Dr. Jamaludin Bin Omar

EEEB273 - Quiz 2 [Question Set 2]
SEMESTER 1, ACADEMIC YEAR 2012/2013
Date: 10 July 2012

Question:

Refer to **Figure 1**. Assume $\beta = 200$ and $V_{BE}(\text{on}) = 0.7$ V for all BJTs in the circuit. For $R_1 = 12$ kΩ and $R_C = 10.8$ kΩ, find the differential voltage gain (A_d) of the differential amplifier taken as **one-sided output**. [10 marks]

Answer:

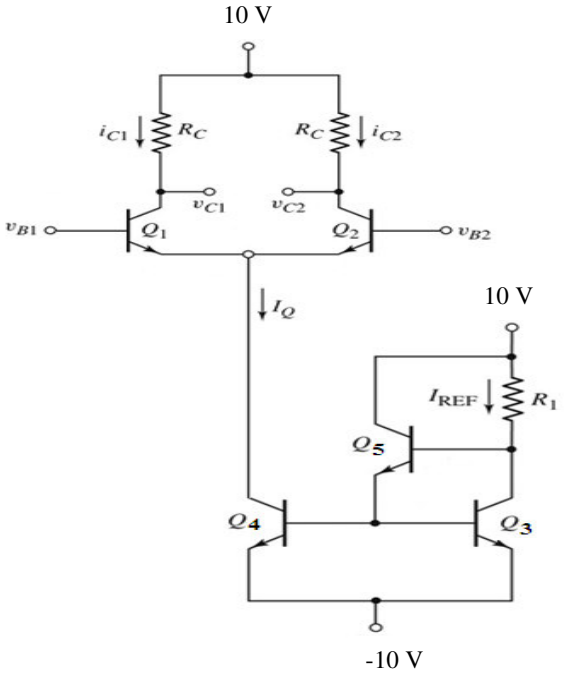

Figure 1

I_{REF} $= (V^+ - V_{BE5} - V_{BE3} - V^-) / (R_1) \approx I_Q$ $(\beta = 200)$ **[2 marks]**
$= (10\text{-}0.7\text{-}0.7\text{-}(-10)) / (12\text{k}) = 1.55$ mA **[2 marks]**

A_d $= (g_m R_C)/2 = (I_Q R_C)/(4V_T)$ **[2 marks]**

g_m $= I_Q / (2V_T) = (1.55\text{m})/(2\text{x}26\text{m}) = 29.8077$ mA/V **[2 marks]**

A_d $= (29.8077\text{m})(10.8\text{k})/(2) = 160.96$ V/V **[2 marks]**

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Lecturer:	Dr. Jamaludin Bin Omar

EEEB273 - Quiz 2 [Question Set 3]
SEMESTER 1, ACADEMIC YEAR 2012/2013
Date: 10 July 2012

Question:

Refer to **Figure 1**. Assume β = 200 and V_{BE}(on) = 0.7 V for all BJTs in the circuit. For R_1 = 10.8 kΩ and R_C = 14 kΩ, find the differential voltage gain (A_d) of the differential amplifier taken as **one-sided output**. [10 marks]

Answer:

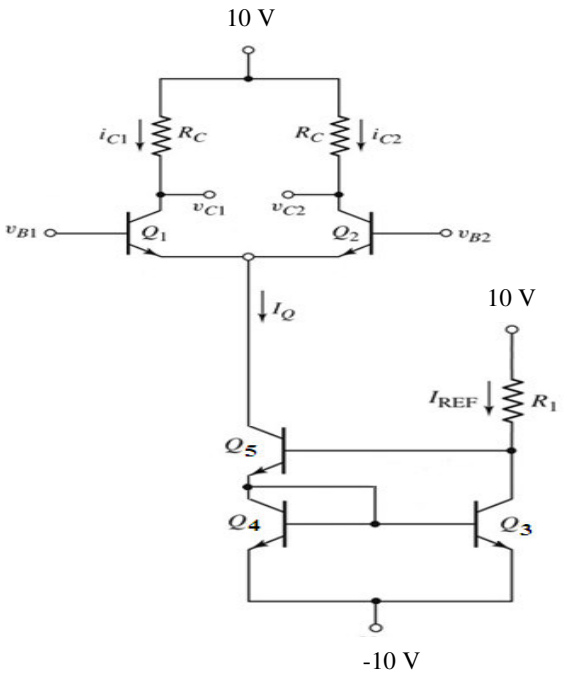

Figure 1

I_{REF} = $(V^+ - V_{BE5} - V_{BE3} - V^-) / (R_1) \approx I_Q$ (β = 200) **[2 marks]**
= (10-0.7-0.7-(-10)) / (10.8k) = 1.722 mA **[2 marks]**

A_d = $(g_m R_C)/2 = (I_Q R_C)/(4V_T)$ **[2 marks]**

g_m = $I_Q / (2V_T)$ = (1.722m)/(2x26m) = 33.1154 mA/V **[2 marks]**

A_d = (33.1154m)(14k)/(2) = 231.808 V/V **[2 marks]**

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Lecturer:	Dr. Jamaludin Bin Omar

EEEB273 - Quiz 2 [Question Set 4]
SEMESTER 1, ACADEMIC YEAR 2012/2013
Date: 10 July 2012

Question:

Refer to **Figure 1**. Assume $\beta = 200$ and $V_{BE}(\text{on}) = 0.7$ V for all BJTs in the circuit. For $R_1 = 10$ kΩ and $R_C = 12.8$ kΩ, find the differential voltage gain (A_d) of the differential amplifier taken as **one-sided output**. [10 marks]

Answer:

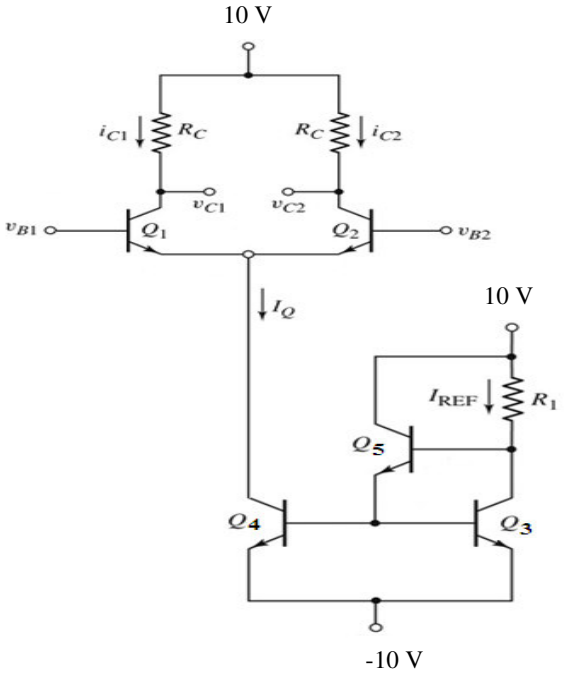

Figure 1

I_{REF} $= (V^+ - V_{BE5} - V_{BE3} - V^-) / (R_1) \approx I_Q$ $(\beta = 200)$ **[2 marks]**
$= (10\text{-}0.7\text{-}0.7\text{-}(-10)) / (10\text{k}) = 1.86$ mA **[2 marks]**

A_d $= (g_m R_C)/2 = (I_Q R_C)/(4V_T)$ **[2 marks]**

g_m $= I_Q / (2V_T) = (1.86\text{m})/(2\text{x}26\text{m}) = 35.7692$ mA/V **[2 marks]**

A_d $= (35.7692\text{m})(12.8\text{k})/(2) = 228.923$ V/V **[2 marks]**