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 2, ACADEMIC YEAR 2012/2013
Date: 19 November 2012

Question:

Refer to **Figure 1**. Assume $\beta = 50$ and $V_{BE}(\text{on}) = 0.7$ V for all BJTs in the circuit. For $R_1 = 12$ kΩ and $R_C = 10$ kΩ, find the differential voltage gain (A_d) of the differential amplifier taken as **one-sided output at v_{C2}**. Write your answer as precise as possible, in 4 decimal points, with proper Units for the parameters. [10 marks]

Answer:

I_{REF} $= (V^+ - V_{BE3} - V^-) / (R_1)$ [2]
$= (10\text{-}0.7\text{-}(-10)) / (12\text{k}) = 1.6083$ mA [1]

I_Q $= I_{REF} / (1+2/\beta)$ [2]
$= 1.608\text{m} / (1+2/50) = 1.5464$ mA [1]

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

g_m $= I_Q / (2V_T)$
$= (1.5464\text{m})/(2\text{x}26\text{m}) = 29.7399$ mA/V [1]

A_d $= (29.7399\text{m x } 10\text{k})/(2) = 148.699$ V/V [1]

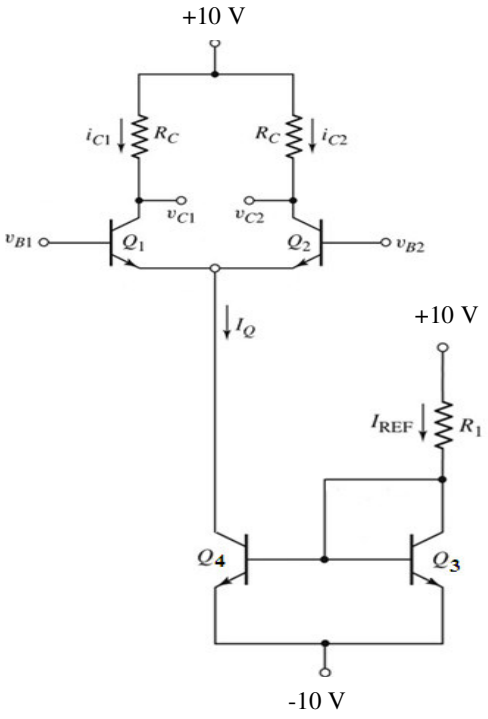

Figure 1

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 2, ACADEMIC YEAR 2012/2013
Date: 19 November 2012

Question:

Refer to **Figure 1**. Assume $\beta = 40$ and $V_{BE}(\text{on}) = 0.7$ V for all BJTs in the circuit. For $R_1 = 15$ kΩ and $R_C = 12$ kΩ, find the differential voltage gain (A_d) of the differential amplifier taken as **one-sided output at v_{C2}**. Write your answer as precise as possible, in 4 decimal points, with proper Units for the parameters. [10 marks]

Answer:

I_{REF} $= (V^+ - V_{BE3} - V^-) / (R_1)$ [2]
$= (10\text{-}0.7\text{-}(\text{-}10)) / (15\text{k}) = 1.2867$ mA [1]

I_Q $= I_{REF} / (1+2/\beta)$ [2]
$= 1.2867\text{m} / (1+2/40) = 1.2254$ mA [1]

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

g_m $= I_Q / (2V_T)$
$= (1.2254\text{m})/(2\text{x}26\text{m}) = 23.5653$ mA/V [1]

A_d $= (23.5653\text{m} \times 12\text{k})/(2) = 141.392$ V/V [1]

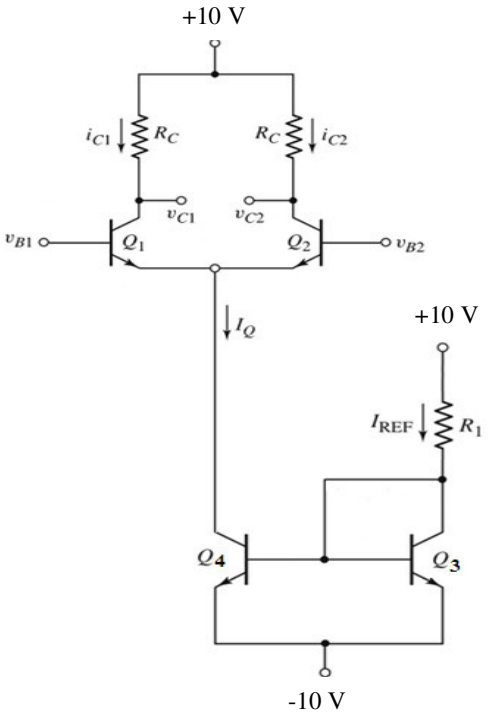

Figure 1

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

EEEB273 - Quiz 2 [Question Set 3]
SEMESTER 2, ACADEMIC YEAR 2012/2013
Date: 19 November 2012

Question:

Refer to **Figure 1**. Assume $\beta = 40$ and $V_{BE}(\text{on}) = 0.7$ V for all BJTs in the circuit. For $R_1 = 14$ kΩ and $R_C = 15$ kΩ, find the differential voltage gain (A_d) of the differential amplifier taken as **one-sided output at v_{C2}**. Write your answer as precise as possible, in 4 decimal points, with proper Units for the parameters. [10 marks]

Answer:

I_{REF} $= (V^+ - V_{BE3} - V^-) / (R_1)$ [2]
$= (10\text{-}0.7\text{-}(\text{-}10)) / (14\text{k}) = 1.3786$ mA [1]

I_Q $= I_{REF} / (1+2/\beta)$ [2]
$= 1.3786\text{m} / (1+2/40) = 1.3129$ mA [1]

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

g_m $= I_Q / (2V_T)$
$= (1.3129\text{m})/(2\text{x}26\text{m}) = 25.2486$ mA/V [1]

A_d $= (25.2486\text{m} \times 15\text{k})/(2) = 189.364$ V/V [1]

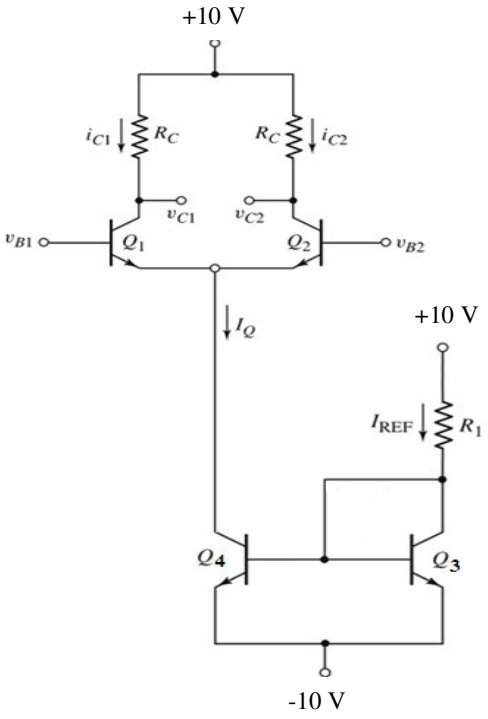

Figure 1

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

EEEB273 - Quiz 2 [Question Set 4]
SEMESTER 2, ACADEMIC YEAR 2012/2013
Date: 19 November 2012

Question:

Refer to **Figure 1**. Assume $\beta = 50$ and $V_{BE}(\text{on}) = 0.7$ V for all BJTs in the circuit. For $R_1 = 18$ kΩ and $R_C = 12$ kΩ, find the differential voltage gain (A_d) of the differential amplifier taken as **one-sided output at v_{C2}**. Write your answer as precise as possible, in 4 decimal points, with proper Units for the parameters. [10 marks]

Answer:

I_{REF} $= (V^+ - V_{BE3} - V^-) / (R_1)$ [2]
$= (10-0.7-(-10)) / (18k) = 1.0722$ mA [1]

I_Q $= I_{REF} / (1+2/\beta)$ [2]
$= 1.0722m / (1+2/50) = 1.03098$ mA [1]

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

g_m $= I_Q / (2V_T)$
$= (1.03098m)/(2x26m) = 19.8265$ mA/V [1]

A_d $= (19.8265m \times 12k)/(2) = 118.959$ V/V [1]

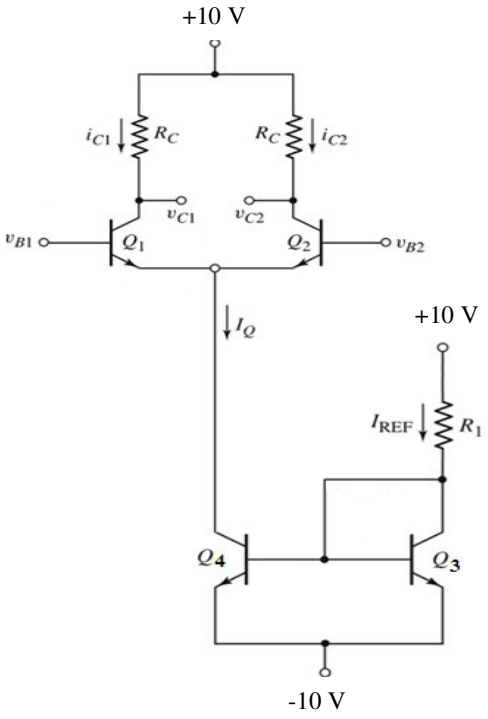

Figure 1