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

EEEB273 - Quiz 3 [Question Set 1]
SEMESTER 2, ACADEMIC YEAR 2010/2011
Date: 18 January 2011

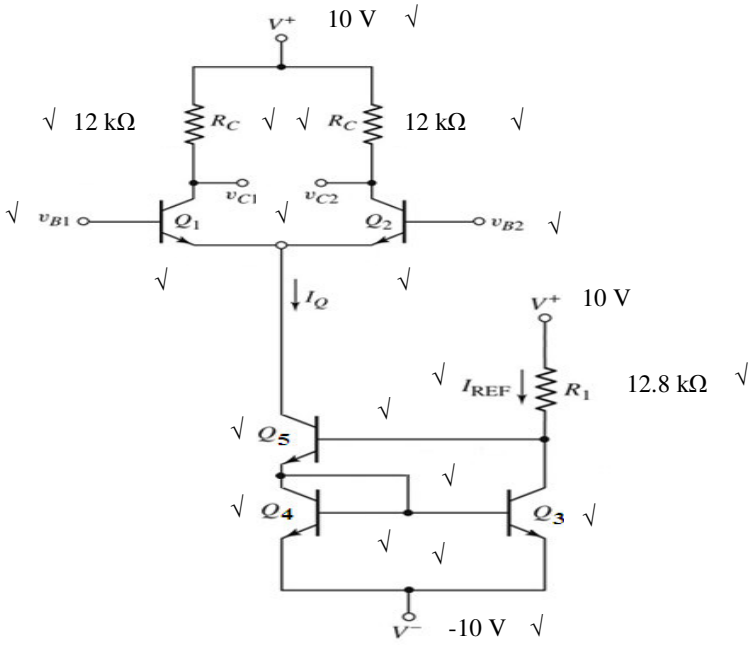
Question:

a) **Draw and label clearly** a complete circuit for a BJT differential amplifier that is biased with a **Wilson** current source. Value for R_C in the BJT differential amplifier is 12 kΩ. Value for R_1 in the Wilson current source is 12.8 kΩ. Power supplies for V^+ and V^- are +10 V and -10 V, respectively. [5 marks]

b) Assume β = 100 and V_{BE} (on) = 0.7 V for all BJTs in the circuit. Find the differential gain of the differential amplifier (A_d) taken as one-sided output. [5 marks]

Answer:

(a)



√ = ¼ mark

(b)

I_{REF} $= (V^+ - V_{BE3} - V_{BE5} - V^-) / (R_1) \approx I_Q$ **[1 mark]**
= (10-0.7-0.7-(-10)) / (12.8k) = 1.453 mA **[1 mark]**

A_d $= (g_m R_C)/2$ **[1 mark]**
g_m $= I_Q / (2V_T)$ **= (1.453m)/(2x26m) = 27.944 mA/V** **[1 mark]**
A_d **= (27.944m)(12k)/(2) = 167** **[1 mark]**

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

EEEB273 - Quiz 3 [Question Set 2]
SEMESTER 2, ACADEMIC YEAR 2010/2011
Date: 18 January 2011

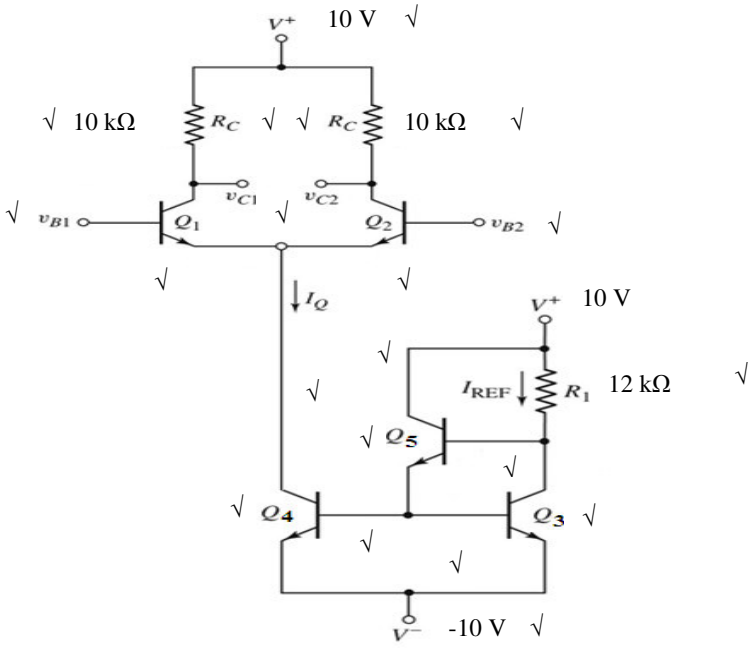
Question:

a) **Draw and label clearly** a complete circuit for a BJT differential amplifier that is biased with a **basic 3-transistor** current source. Value for R_C in the BJT differential amplifier is 10 kΩ. Value for R_1 in the basic 3-transistor current source is 12 kΩ. Power supplies for V^+ and V^- are +10 V and -10 V, respectively. [5 marks]

b) Assume β = 100 and V_{BE} (on) = 0.7 V for all BJTs in the circuit. Find the differential gain of the differential amplifier (A_d) taken as one-sided output. [5 marks]

Answer:

(a)



√ = ¼ mark

(b)

I_{REF} $= (V^+ - V_{BE3} - V_{BE5} - V^-) / (R_1) \approx I_Q$ **[1 mark]**
= (10-0.7-0.7-(-10)) / (12k) = 1.55 mA **[1 mark]**

A_d $= (g_m R_C)/2$ **[1 mark]**
g_m $= I_Q / (2V_T)$ **= (1.55m)/(2x26m) = 29.807 mA/V** **[1 mark]**
A_d **= (29.807m)(10k)/(2) = 149** **[1 mark]**