5/24-Quiz5

滿分: 100 分
及格分數: 60 分
試題數: 10 題
配分方式: 平均配分,每題約 10 分

題組 (共 5 題)

For question 1-5, consider the CMOS cascode amplifier shown in Figure 1.

$$V_{DD} = 5V, V_{in} = 1V, V_{b1} = 1.5V, V_{b2} = 2.5V, V_{b3} = 3.5V, V_{THN} = |V_{THP}| = 0.5V, \left(\frac{W}{L}\right)_{1,2} = 8,$$

$$\left(\frac{W}{L}\right)_{3,4} = 4, \ I_D = 0.1mA, \ \mu_n C_{ox} = 100\mu A/V^2, \ \mu_p C_{ox} = 50\mu A/V^2, \ \lambda_n = \lambda_p = 0.1V^{-1}$$
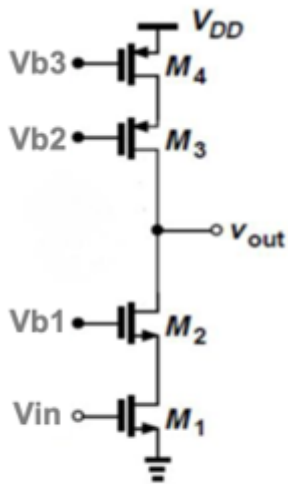

Figure 1

The transconductance of M1,gm1 = ?

○ A. 200μA/V

◉ B. 400μA/V

○ C. 600μA/V

○ D. 800μA/V

難易度: 適中

The output resistance, Rout should be?

○ A. 4MΩ

○ B. 2MΩ

◉ C. 1.3MΩ

○ D. 1MΩ

難易度: 適中

10

Voltage gain of the circuit, Av=?

◉ A. -520 V/V

○ B. -52 V/V

○ C. 52 V/V

○ D. 520 V/V

難易度: 適中

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What is the output swing, Vout,max - Vout,min =?

○ A. 1V

◉ B. 2V

○ C. 3V

○ D. 4V

難易度: 適中

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Which of the following can increase Av of this cascode amplifier?

◉ A. Add another cascode stage to increase Rout

○ B. Reduce one cascode stage to increase Rout

○ C. Decrease gm1

○ D. Increase gm4

難易度: 適中

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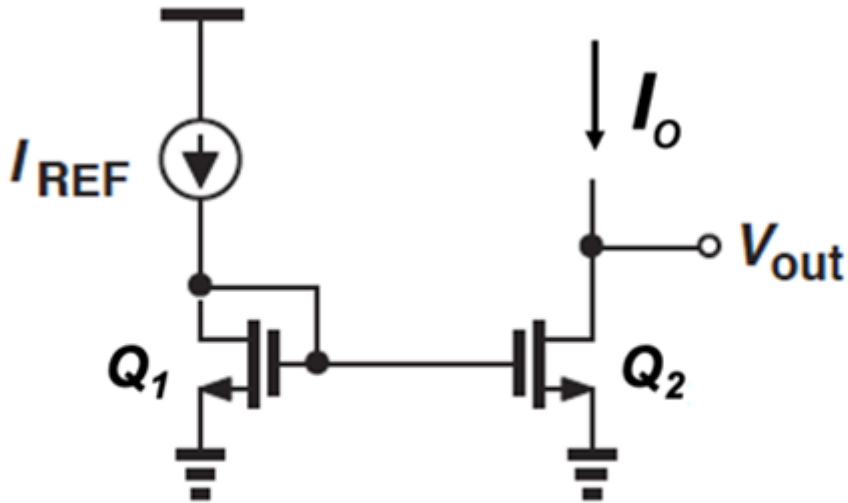6　Which statement is true in describing the circuit in Figure 2?

Figure 2

○ A. It is a BJT current mirror

◉ B. Q1 is always in saturation region

○ C. Q2 is always in saturation region

○ D. The ratio between Io and IREF is independent of channel width and length of both transistors

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難易度: 適中

10 分

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7 What is the Icopy/IREF in Figure 3? Assume all devices operate in saturation and have the same VTH.
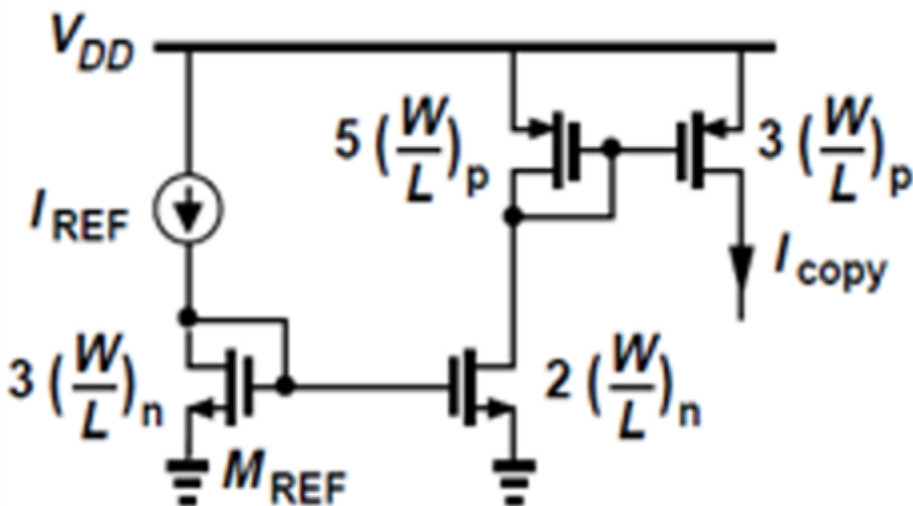

Figure 3

◉ A. 2/5

○ B. 3/5

○ C. 5/2

○ D. 5/3

難易度: 適中

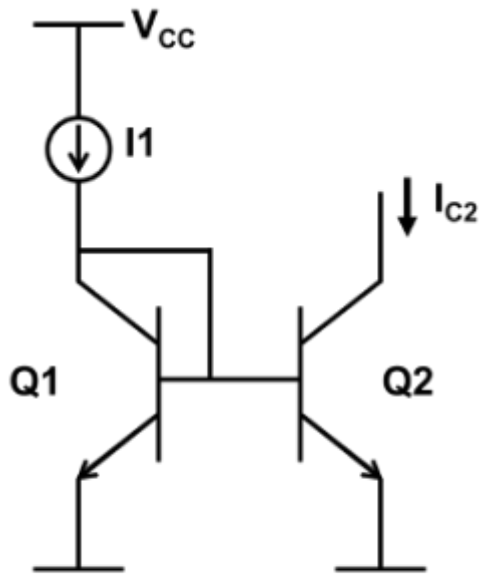8 In Figure 4, Q1 and Q2 are identical with the same β,
  which one is correct?

Figure 4

⦿ A. IC2=β/(2+β) I1

○ B. IC2=I1

○ C. IC2=(2+β)/β I1

○ D. IC2=(1+β)/β I1

難易度: 適中

9 In Figure 5, if(W/L)2 = 2*(W/L)1, which answer is correct?
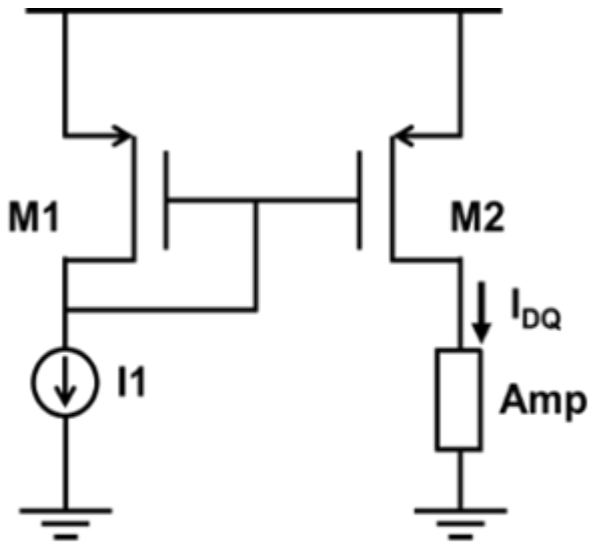
Figure 5

○ A. IDQ=2*I1

○ B. IDQ=I1

○ C. IDQ=0.5*I1

○ D. IDQ=0

難易度: 容易

10 分

10 In Figure 6, if (W/L)2 = 2*(W/L)1, 3*(W/L)3 = (W/L)4, IDQ=?
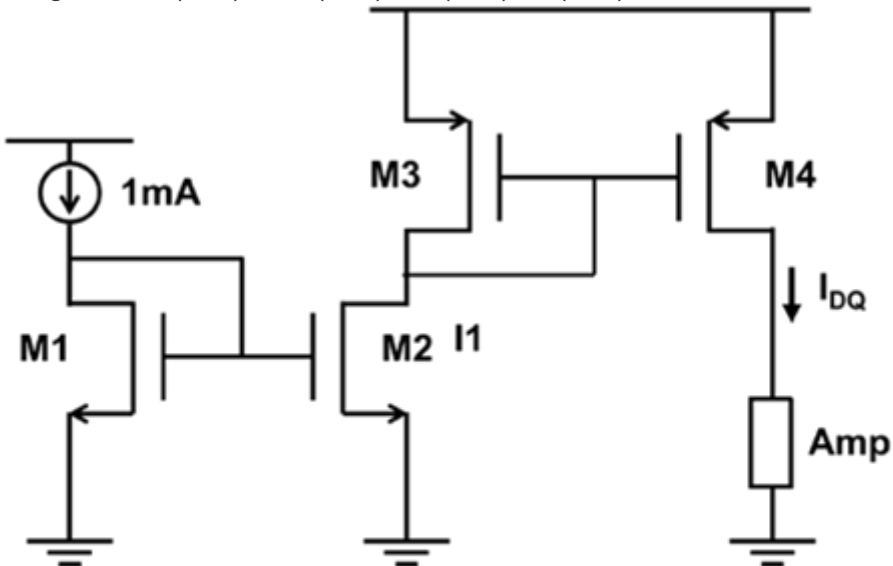
Figure 6

○ A. IDQ=6mA

○ B. IDQ=0.167mA

○ C. IDQ=0.667mA

○ D. IDQ=1.5mA

難易度: 適中

10 分

線上： 932 人

難易度: 適中