Quiz 10

Due 18 Aug 2021 at 23:59 **Points** 10 **Questions** 10 **Time limit** 30 Minutes

Instructions

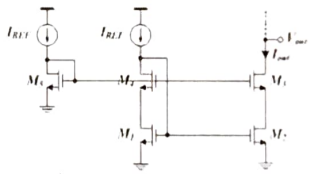
- The quiz will be displayed one question at a time. After you answer a question you will not be allowed to go back and modify your answer.
- The quiz is time limited. You must complete the quiz in a single session.
- The quiz is open-book. You may check the lectures, the textbook, or even the internet.
- You may need a calculator. You can use the calculator application of your computer or smart phone.
- For multiple choice questions: Choose the best answer.
- For numerical questions: Write your answer as a decimal number with three digits of precision (ex: 1.33). Do NOT use fractions (ex: 4/3 is not accepted) and do NOT use commas (ex: 1,33 is not accepted).
- You are NOT ALLOWED to share questions and/or answers with anyone.
- Sharing questions and/or answers will be considered CHEATING.
- Remember: قال رسول الله صلى الله عليه وسلم: من غش فليس منا
- If you share questions you will get ZERO marks for this quiz.
- If you share answers you will get ZERO marks for this quiz and the next one.
- You will be able to access the questions, your answers, and the correct answers after the due date of the quiz.
- دعواتي لك بالتوفيق

Attempt history

	Attempt	Time	Score
LATEST		30 minutes	

Question 1

For the shown wide-swing current mirror, assume VTH = 0.4 V and Vov (of M1-4) = 0.2 V. If it is required to set VB (drain voltage of M5) at the center of its valid range, then L5 should be _____ times L1-4 .



$\because V_{GS3,4} + V_{ov1,2} \leq V_B < V_{GS1,2} + V_{TH3,4}$

$\therefore 0.8 \leq V_B < 1 \rightarrow V_B = 0.9$

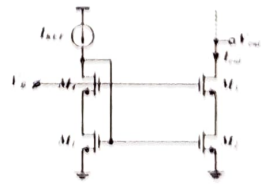
$\because V_B = V_{TH} + V_{ov5} \rightarrow V_{ov5} = 0.5$

$\because \frac{L5}{L1-4} = \left(\frac{V_{ov5}}{V_{ov1-4}}\right)^2 = 6.25$

6.25

Question 2

For the shown wide-swing current mirror, assume VTH = 0.4 V and Vov = 0.2 V. The minimum allowed value for VB is _____ V.



$V_B \geq V_{GS3,4} + V_{ov1,2}$

$\therefore V_B \geq 0.8$

1.2

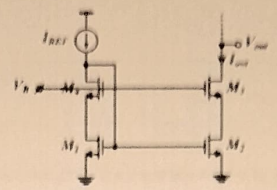
1

0.6

0.8

Question 3

For the shown wide-swing current mirror, assume VTH = 0.4 V and Vov = 0.2 V. If it is required to maximize M2 output impedance, then VB should be set to _____.



All answers are wrong

its maximum allowed value

the center of its allowed range

its minimum allowed value

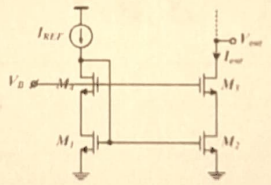
∵ R_{out} of M2 = $r_o = f(V_{DS2})$

∵ $V_{DS2} \propto V_B$

∴ max r_o is ∋ max V_{DS2} is ∋ max V_B

Question 4

For the shown wide-swing current mirror, assume VTH = 0.4 V and Vov = 0.2 V. If it is required to maximize the compliance range (minimize the compliance voltage), then VB should be set to _____.



the center of its allowed range

All answers are wrong

its minimum allowed value

its maximum allowed value

∵ $V_{Comp} = V_{DS1} + V_{DS2}$

∵ $V_{DS2} = f(V_B)$

∴ min V_{Comp} is ∋ min V_{DS2} is ∋ min V_B

Question 5

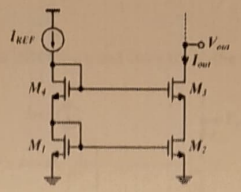
For the cascode current mirror shown below, if Vout decrease below the compliance voltage, the first transistor to get out of saturation is _____.

∵ $V_{out} = V_{DS3} + V_{DS2}$

∵ V_{DS2} Set by V_{GS3}

∴ If $V_{out} \downarrow$, $V_{DS3} \downarrow$

∴ M3 is the first to get out Sat



M2

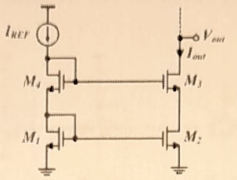
M4

M3

M1

Question 6

For the cascode current mirror shown below, assume VTH = 0.4 V and Vov = 0.2 V for all transistors. The compliance voltage for the current mirror is equal to _____ V.



1.2

0.6

0.8

1

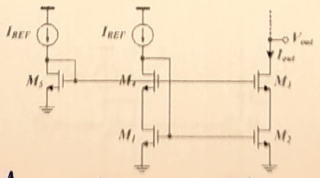
$V_{Comp} = V_{DS3} + V_{DS2} = V_{ov3} + V_{GS2}$

$= 0,2 + 0,4 + 0,2$

$= 0,8$

Question 7

For the shown wide-swing current mirror, if circuit simulations show that M3 is in triode although VB (drain voltage of M5) is set to its minimum value and you do not want to reduce the output impedance, then a possible solution to try is to _____.



Increase W1-5

Decrsease L1-5

Increase L1-5

All answers are wrong

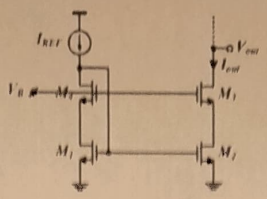
∵ $V_B = V_{GS5} = V_{GS3} + V_{DS2}$

∴ to get M3 into Sat we need to increase V_{DS3} by decrease V_{DS2}

∴ decrease V_{GS5} by ↗ Increase W1-5 / ↘ Decrease L1-5 → Change Rout

Question 8

For the shown wide-swing current mirror, assume VTH = 0.4 V and Vov = 0.2 V. The maximum allowed value for VB is _____ V.



1.2

1

0.8

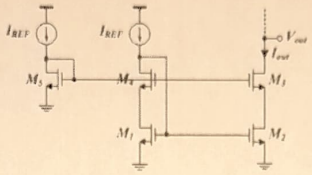
0.6

$V_{B\,max} = V_{TH3,4} + V_{GS1,2}$

$= 0.4 + 0.4 + 0.2 = 1$

Question 9

For the shown wide-swing current mirror, if circuit simulations show that M1-2 are in triode then a possible solution to try is _____.



increase W5

All answers are wrong

increase L5

decrease L5

$\therefore V_B = V_{GS5} = V_{GS3} + V_{DS2}$

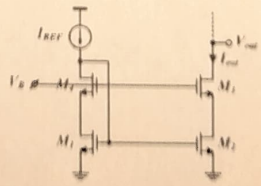
$\therefore$ If M2 in triode $\rightarrow$ increase V_{DS2}

$\therefore$ We should increase V_{GS5}

$\therefore$ We should increase L5

Question 10

For the shown wide-swing current mirror, assume VTH = 0.4 V and Vov = 0.2 V. If VB is set to to be 0.9 V, then the compliance voltage is _____ V.



1.1

0.9

0.5

0.7

$V_B = V_{TH3,4} + V_{OV3,4} + V_{DS2}$

$\therefore V_{DS2} = 0.9 - 0.4 - 0.2 = 0.3$

$\therefore V_{Comp} = V_{OV3,4} + V_{DS2} = 0.5$