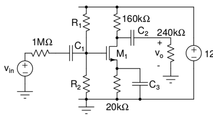
Unit 7 - Week 5 - CS amplifier using source feedback bias; Controlled sources using a MOS transistor-VCVS

Assignment 5

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2020-03-04, 23:59 IST.

1)



$\mu_n C_{ox} = 100\mu A/V^2, W/L = 1, V_T = 1$ V.

In the above circuit, the operating point current in M_1 is 50μA, and that in R_1 and R_2 is 1μA. Determine the following:

Small signal gain v_o/v_{in} assuming that the capacitors are shorts at the signal frequency.

(The answer must be the value of the gain. Round off fractional answers to two decimal places.)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) -6.65,-6.64

1 point

2)

Constraint on capacitor C_3 so that it is a short at a signal frequency of 10 kHz. $C_3 \gg C_0$. Determine C_0. (This constraint is slightly different from that discussed in the lecture because a resistor is used at the source of M_1 for biasing instead of a current source. Re-evaluate the constraint considering the total resistance across the capacitor).

(The answer must be in **nanofarads (nF)**. Round off fractional answers to two decimal places.)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 2.36,2.39

1 point

3)

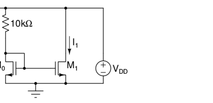
While constructing the circuit, you forget C_3 altogether. What is the small signal gain v_o/v_{in} assuming that the remaining capacitors are shorts at the signal frequency?

(The answer must be the value of the gain. Round off fractional answers to two decimal places.)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) -2.22, -2.21

1 point

4)



$\mu_n C_{ox} = 100\mu A/V^2, W/L = 1, V_T = 1$ V, $V_{DD} = 5$ V. $M_{0,1}$ are perfectly matched.

Determine the current I_1.

(The answer must be in **microamperes** (μA). Round off fractional answers to one decimal place.)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Numeric) 200

1 point

5)

If V_{DD} increases to 5.5 V, determine the increase in I_1. You can of course re-do the earlier steps. But an easier way is to carry out incremental analysis by representing the change in V_{DD} as a small signal source and using the incremental equivalent circuit of the transistors. (You are encouraged to do both and compare the answers).

Change in I_1 (with appropriate sign; A positive change means a larger I_1 than before).

(The answer must be in **microamperes** (μA). Round off fractional answers to one decimal place.)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 33.3,33.4

1 point

6)

Assume that $V_{DD} = 10$ V and R_D is changed to obtain the same quiescent current as before (with $V_{DD} = 5$ V and $R_D = 10$kΩ). Re-evaluate the change in I_1 if V_{DD} increases to 10.5 V. As before, use incremental analysis. Compare the change in this case to that in the earlier case.

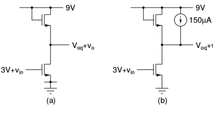
Change in I_1 (with appropriate sign; A positive change means a larger I_1 than before).

(The answer must be in **microamperes** (μA). Round off fractional answers to one decimal place.)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Numeric) 12.5

1 point

7)



$\mu_n C_{ox} = 100\mu A/V^2, W/L = 1, V_T = 1$ V. Determine the small signal gain v_o/v_{in} in the two circuits shown above. Relate these to the results in the lesson "Diode connected transistor" and related activity questions.

Small signal gain v_o/v_{in} in (a):

(The answer must be the value of the gain. Round off fractional answers to one decimal place.)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Numeric) -1

1 point

8)

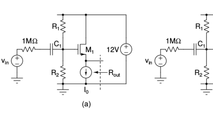
Small signal gain v_o/v_{in} in (b):

(The answer must be the value of the gain. Round off fractional answers to one decimal place.)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Numeric) -2

1 point

9)



$\mu_n C_{ox} = 100\mu A/V^2, W/L = 1, V_T = 1$ V.

The source follower in (a) is required to have an output resistance of 5 kΩ. Determine the bias current I_0.

(The answer must be in **microamperes** (μA). Round off fractional answers to one decimal place.)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Numeric) 200

1 point

10)

The source follower is actually implemented as shown in (b) with a resistor R_3 substituted for the current source. The quiescent voltage across R_3 is specified to be 5V. Determine the small signal gain v_o/v_i in (b). Assume that C_1, R_1, R_2 are very large.

(The answer must be the value of the gain. Round off fractional answers to two decimal places.)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Numeric) 0.83

1 point