

Unit 11 - Week 9 - Common source amplifier with active load; CMOS inverter

Course outline

How does an NPTEL online course work?

Week 0

Week 1 - Obtaining power gain and need for nonlinearity

Week 2 - Nonlinear two ports; MOS transistor; Common source amplifier

Week 3 - Common source amplifier using the MOS transistor

Week 4 - Biasing a MOS transistor at a fixed drain current; CS amplifier using drain feedback bias and current mirror bias

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

Week 6 - Controlled sources continued-VCCS, CCCS, CCVS

Week 7 - Opamp controlled sources; Virtual short; Swing limits; Summary of amplifiers

Week 8 - pMOS transistor; Converting pMOS circuits to nMOS

Week 9 - Common source amplifier with active load; CMOS inverter

- Gain limitation in a common source amplifier with resistive load
- nMOS active load for pMOS common source amplifier
- CMOS inverter
- Large signal characteristics of pMOS CS amplifier with nMOS active load
- Large signal characteristics of nMOS CS amplifier with pMOS active load
- Large signal characteristics of a CMOS inverter
- Active load amplifiers as digital gates
- Sensitivity of output bias to input bias in a CMOS inverter
- Self biasing a CMOS inverter
- An application of self biased inverters
- Current consumption of a self-biased inverter; Current biasing

Quiz : Assignment 9

- Analog Circuits: Week 9 Feedback form
- Assignment 9 Solutions

Week 10 - Differential pair with current mirror load; Single-stage opamp

Week 11 - Two-stage opamp; Opamp characteristics

Week 12 - Bipolar transistors

Lecture Notes

Text Transcripts

DOWNLOAD VIDEOS

Books

Assignment 9

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

Due on 2020-04-01, 23:59 IST.

1)

$\mu_n C_{ox} = 400\mu\text{A}/\text{V}^2, W/L = 16, V_{Tn} = 0.5\text{V}.$

What is the maximum gain magnitude $|v_o/v_i|$ possible in the circuit above?

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

No, the answer is incorrect. Score: 0
Accepted Answers: (Type: Numeric) 10

1 point

2)

$M_p: \mu_p C_{ox} = 100\mu\text{A}/\text{V}^2, W_p/L_p = 4, V_{Tp} = 0.5\text{V}, \lambda_p = 0.05\text{V}^{-1}.$
 $M_n: \mu_n C_{ox} = 400\mu\text{A}/\text{V}^2, W_n/L_n = 1, V_{Tn} = 0.5\text{V}, \lambda_n = 0.05\text{V}^{-1}$

What is the gain v_o/v_i in the circuit above?

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

No, the answer is incorrect. Score: 0
Accepted Answers: (Type: Numeric) -20

1 point

3)

$M_p: \mu_p C_{ox} = 100\mu\text{A}/\text{V}^2, W_p/L_p = 4, V_{Tp} = 0.5\text{V}, \lambda_p = 0.05\text{V}^{-1}.$
 $M_n: \mu_n C_{ox} = 400\mu\text{A}/\text{V}^2, W_n/L_n = 1, V_{Tn} = 0.5\text{V}, \lambda_n = 0.05\text{V}^{-1}$

What is the gain v_o/v_i in the circuit above?

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

No, the answer is incorrect. Score: 0
Accepted Answers: (Type: Numeric) -20

1 point

4)

$M_p: \mu_p C_{ox} = 100\mu\text{A}/\text{V}^2, W_p/L_p = 4, V_{Tp} = 0.5\text{V}, \lambda_p = 0.05\text{V}^{-1}.$
 $M_n: \mu_n C_{ox} = 400\mu\text{A}/\text{V}^2, W_n/L_n = 1, V_{Tn} = 0.5\text{V}, \lambda_n = 0.05\text{V}^{-1}$

What is the gain v_o/v_i in the circuit above?

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

No, the answer is incorrect. Score: 0
Accepted Answers: (Type: Numeric) -40

1 point

5)

$M_p: \mu_p C_{ox} = 100\mu\text{A}/\text{V}^2, W_p/L_p = 1, V_{Tp} = 0.5\text{V}, \lambda_p = 0.05\text{V}^{-1}.$
 $M_n: \mu_n C_{ox} = 400\mu\text{A}/\text{V}^2, W_n/L_n = 4, V_{Tn} = 0.5\text{V}, \lambda_n = 0.05\text{V}^{-1}$

What is the bias voltage $V_{o,bias}$ in the circuit above?

(The answer must be in volts (V). Round off fractional answers to one decimal place.)

No, the answer is incorrect. Score: 0
Accepted Answers: (Type: Range) 1.48,1.52

1 point

6)

What is the bias current flowing through the transistors in the circuit above?

(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) 800

1 point

7)

What is the gain v_o/v_i in the circuit above? Assume that R_G is very large.

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

No, the answer is incorrect. Score: 0
Accepted Answers: (Type: Numeric) -25

1 point

8)

If $v_i = V_p \cos(\omega t)$, what is the maximum value of V_p that can be applied to the circuit while maintaining all transistors in saturation region?

(The answer must be in millivolts (mV). Round off fractional answers to one decimal place.)

No, the answer is incorrect. Score: 0
Accepted Answers: (Type: Range) 19,20

1 point

9)

$M_p: \mu_p C_{ox} = 100\mu\text{A}/\text{V}^2, W_p/L_p = 4, V_{Tp} = 0.5\text{V}, \lambda_p = 0.05\text{V}^{-1}.$
 $M_n: \mu_n C_{ox} = 400\mu\text{A}/\text{V}^2, W_n/L_n = 1, V_{Tn} = 0.5\text{V}, \lambda_n = 0.05\text{V}^{-1}$

What is the gain v_o/v_i in the circuit above? R_1 and R_2 are very large.

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

No, the answer is incorrect. Score: 0
Accepted Answers: (Type: Numeric) -80

1 point

10)

If $v_i = V_p \cos(\omega t)$, what is the maximum value of V_p that can be applied to the circuit while maintaining all transistors in saturation region?

(The answer must be in millivolts (mV). Round off fractional answers to one decimal place.)

No, the answer is incorrect. Score: 0
Accepted Answers: (Type: Range) 6.1,6.2

1 point