 University of the Philippines

 Microelectronics and Microprocessors Laboratory

Lab Module 06 – Answer Sheet

Name: Lastname, Firstname

Student #: 20XX-XXXXX

Class: SATURDAY AM / SATURDAY PM

SCORE: XX/40

Instructions:

This is answer sheet is a format only. You may answer using any word processor (i.e. Microsoft Word, Libre Office, Latek, Google docs … etc.) but you need to submit either a pdf or docx file so we can comment on it. Make sure to put your name, student number, and indicate what lab class you are in. This is given in the format above. Name your file “coe197\_class\_lastname\_studentnumber”. For the class write “satam” or “satpm” if you’re in the morning or afternoon class, respectively. For example: “coe197\_satam\_antonio\_201101474”.

When you make your document please maintain the order of the main sections (PART I, PART II, PART III, and PART IV) and stick to the numbering provided in this answer sheet. You may use this word document if you like.

Answer with clear and concise solutions. Indicate your final answer (box it, bold it, change its color but please do not use red font color). For problems that require explanations, elaborate your thoughts. Any unclear answers will be marked wrong. There will be partial points.

**Have fun and learn by heart!**

Part I: Review (1pt.)

1. What is a common source amplifier?

Part II: Training (11 pts)

## Question Q2.1: (1pt.)

Given some transistor configuration, what’s the first thing we always ask?

## Question Q2.2: (2pts.)

Using Figure 2.2 can you visually describe what happens when , where does go and how does this translate to ? Explain thoroughly.

## Question Q2.3: (3pts.) 1pt. each

What operating region is the transistor in when:

2. ?
3. ? *Hint: Recall that*

## Question Q2.4: (2 pts)

Put on your thinking hat and try this out. A resistor-loaded NMOS common-source amplifier has a supply

voltage of 1.2V. The NMOS transistor was biased to achieve a . Don’t panic the is just the units for . What is assuming the transistor is a square-law device? What is the gain that can be achieved if the output DC voltage is set at half of the supply? (Hint: use the equations! ).

## Question Q2.5: (1 pt) 0.5 pts each

What is when What about when ?

## Question Q2.6: (1 pt) 0.5 pts each

What gives us What about ?

## Question Q2.7: (1 pt) 0.5 pts each

What is the that gives us What about ?

Part III: Exercise (16 pts)

## DIY: CS Amplifier with Resistive Load

Design your own CS amplifier with a resistive load for the following specs:

* should be at least 87.5% of the ideal.
* Begin with and final size should be in multiples of only.

Here are the steps as a guide:

1. Determine and (2pts.)

2. Estimate the expected ideal and compute the target minimum gain. (2pts.)

3. Calculate the target intrinsic gain . (2pts.)

4. Size the length so that your transistor achieves the desired . (2pts.)

5. Size the width to get the desired . (2pts.)

6. Calculate the load resistance to support the desired (2pts.)

7. Verify your design! (4pts.)

Provide the following:

* Your thinking process for every step.
* Please provide sufficient plots and calculations that explains your design process.
* Highlight (bold, color, put in a table) your final transistor size, intrinsic gain , , and actual gain.
* Be sure to provide your final gain plot similar to Figure 2.15.