Exam Review Guide for EPE2165

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August 23, 2022

1 General Exam instructions

- You have 2 hours to complete the exam. Be a smart test taker: if you get stuck on one problem go on to the next.

- The exam paper comprises 2 pages, excluding the title page.

- This exam paper contains 3 questions. **ALL questions are compulsory**. You are expected to do all the 3 questions all the exam

- **Please box your final answer** and keep your answers short and to the point. Longer is not necessarily better as the number of written words is NOT a grading criterion and, in some case, longer answers may even make your answer abstruse.

- **Bring your own calculator**

- Write legibly. If I cannot read it, you will not get credit for it.

- Write all your answers in the answer booklet provided

- Do not forget to write your Registration Number

2 Chapter 1—Signals and Amplifiers

- Understand the most basic and pervasive signal-processing function: signal amplification, and correspondingly, the signal amplifier.

- Understand how the frequency response of an amplifier is measured and expressed in dB

- How amplifiers are characterized (modeled) as circuit building blocks independent of their internal circuitry.

- Understand the needs for Cascaded Amplifiers and the ability to solve parameters for a cascaded amplifier (for example,the student is expected to be able to solve exercise 1.16 on page 27 of the textbook)

3 Chap 4—Diodes

- Understand the characteristics of the ideal diode and how to analyze and design circuits containing multiple ideal diodes together with resistors and dc sources to realize useful and interesting nonlinear functions.

- The ideal and constant voltage model of the diode

- Given a diode circuit, sketch the corresponding output voltage and current, and compute RMS peak voltage and RMS peak current (see for example exercise 4.6 in the solved exercises for the diode)

- Rectifier circuits and how they convert AC voltages to DC

- You should be able to solve examples in the textbook—especially example 4.1 on page 180, example 4.2 on page 181 and exercise 4.4 (e) and (f) on page 183.

- You should be able to solve questions on homework #2. Take a particular attention to question 1, 4 and 5

4 Chapter 5—MOSFET

- The physical structure of the MOS transistor and how it works. You should fully understand Figure 5.1 on page 249 and all of its parameters,their units and what purpose they serve in a MOSFET

- Know how to compute (e.g., memorize formulas) the oxide capacitance C_{ox}, the process conductor k_n, transconductance parameter k'_n, electron drift velocity, transistor aspect ratio, and the current i_D. You should also remember what are The International System of Units (SI) in which each of these parameters is expressed in.

- Understand how a channel for current flow in a MOSFET is created, the concept of overdrive voltage and how it is calculated, inversion layer, andthe threshold voltage.

- Understand the impact on the MOSFET operation when v_{DS} is small and when it is high and how to compute the resulting i_D

- Know the various region of operation of a MOSFET (off, triode and saturation) and why they occur.

- Know equation for i_D when the MOSFET is in the triode region and when it is in the saturation region.

- You should understand Table 5.1 (Regions of Operation of the Enhancement NMOS Transistor) on page 266, and its equations.

- Understand The iD vs v_{GS} Characteristic (e.g., understand Figure 5.13 on page 267)

- How to solve MOSFET Circuits at DC and understand all exercises we solved in the lecture.

- It is important to know the distinction between a PMOS and NMOS—especially how they are schematically represented and how their equations are expressed. **There will be a question that uses a NMOS and a PMOS.**

5   Chapter 6—BJT

- Understand how the voltage between two terminals of the transistor controls the current that flows through the third terminal, and the equations that describe these current–voltage characteristics.

- How to computer I_B, I_C, I_E, V_E, V_{CESat} and the transistor power dissipated through a BJT

- Understand the various mode of operation for a MOSFET

- You should understand Table Table 6.3 on page 334 which shows the Models for the Operation of the BJT in DC Circuits

- Common emitter BJT circuits (please make sure you can solve all examplesin the lectures)

- Solve BJT circuit at DC, find the mode of operation given a circuit and compute different currents and voltage (e.g., I_B, I_C, I_E, V_E, V_{CESat})

- You should be able to solve circuits with BJTs. **There will be a questions similar (but completely different) to the question 3 on the past exam.**