

EEL 6795 Power-Aware Computing Exam

Take-Home – Summer 2022

Score: Score out of 200 points

NAME: _____

DATE: _____

Instructions:

- Do not underline unless it is needed.
- For legends, do not use color legends. Your exam should be understandable printed in B&W.
- Make sure you create your work on your own. Use your own words. Do not copy and paste from the internet or book(s). However, you can use resources if needed and make sure you cite them. **However, if you copy verbatim, you need to mention and add quotes. It does not mean that you can quote long paragraphs. You also need to cite if you paraphrase from a book, publication, or any other source. If your answer is a complete cite, you may not get full credit or no credit at all. USE YOUR OWN WORDS and UNDERSTANDING.**
- Do not share questions or answers with anyone. Doing so, may carry penalties including deduction of grade, an F for the exam, and F for the class, or even be reported. It is not worth it.
- Interpreting the question in your manner does not provide a cover for your answer. You can send me an email at gchaparr@fiu.edu and provide ample time for me to reply. When emailing, you must be specific, including your name, the class, and what your question is. However, please do not ask me how to do something or for the answer. You are taking a test, the same as if you were in the class.
- It is your responsibility to understand the question and provide the correct answer.
- As you know, following instructions, providing organized, detailed information, and answering clearly will give you the best shot for the best grade.
- Upload a PDF to the CANVAS system – Failing to do so (or uploading a different file) will be penalized.
- Return file as PDF (when submitting online).
- Add a footer to each page to have your last name and the first letter of your first name. (Example: Chaparro, G.)

1. [15 points] Discuss the different components of the overall power consumption in a CMOS-based electronic system.
2. [15 points] Why the power/thermal-aware design is critical for today's electronic system design?
3. [15 points] From your perspective, why does the industry change its gear from a high working frequency single processor to multi-core architecture?
4. [15 points] Explain the concept of concurrency and explain why Amdahl's law limits its application to a system.
5. [15 points] What do we mean by technology mapping? How does it help to reduce the power consumption of an IC?
6. [15 points] Discuss the advantages and disadvantages of the asynchronous design regarding energy efficiency.
7. [15 points] Explain what "DVFS" is and why it is a commonly used technique in power and thermal-aware design.
8. [15 points] Explain why using hierarchical bit lines and word line helps reduce the memory's power consumption.
9. [15 points] Explain why the pipeline implementation of an IC circuit may help to save energy.
10. [15 points] Explain why general-purpose processors usually are less energy efficient than a customized processor (ASIC).
11. [15 points] Explain the concepts of global and local clock gating.
12. [15 points] Explain why software optimizations are crucial for reducing the energy and power consumed by the system.
13. [20 points] Watch the following lecture and provide a summary of it. "Stanford Seminar - The future of low power circuits and embedded intelligence" (<https://youtu.be/IQcuJ4GK3Q0>)