

# Virginia Tech - ECE 5484 - Summer 2020

## Homework 7

Before starting this homework assignment, please be sure that you have completed all of the following activities.

- View the relevant online lectures and read associated sections in the textbook before or while you work on this homework assignment.
- Review the course syllabus. Note the grading policies, including policies for submitting assignments.
- Review the course schedule. Note the due dates for course assignments, including this one.
- Review the Graduate Honor System at <https://graduateschool.vt.edu/academics/expectations/graduate-honor-system.html>. Review the Graduate Honor System Constitution, especially Articles I (Sections 1, 2, and 3), V, VI, VII, VIII, and IX.

Please note the following.

- Solutions must be clear and presented in the order assigned. Solutions must show work needed, as appropriate, to derive your answers. Written answers should be concise, but sufficiently complete to answer the question. Neat hand drawings, where needed, are acceptable. Your final solution for each problem must be easily identified.
- At the top of the first page, include: your name (as recorded by the university); your email address; and the assignment name (“ECE 5484, Homework 7”). Do *not* include your Virginia Tech ID number or your social security number.
- Homework must be submitted as a PDF (.pdf) file with the file name *lastname\_firstname\_HW7.pdf*, where *lastname* is your last or family name and *firstname* is your first or given name. Submit a single file.
- Submit your assignment using the Assignments area of the class website. You must submit your assignment by 11:55 p.m. on the due date.

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1. Suppose a RISC machine uses overlapping register windows with:

- 10 global registers
- 6 input parameter registers
- 10 local registers
- 6 output parameter registers

How large is each overlapping register window?

2. Suppose a RISC machine uses overlapping register windows for passing parameters between procedures. The machine has 298 registers, and each register window has 32 registers, of which 10 are global variables and 10 are local variables. Answer the following:

- a. How many registers would be available for use by input parameters?
- b. How many registers would be available for use by output parameters?
- c. How many register windows would be available for use?
- d. By how much would the current window pointer (CWP) be incremented at each procedure call?

3. Flynn’s taxonomy consists of four primary models of computation. Briefly describe each of the categories and give an example of a high-level problem for which each of these models might be used.

4. Describe briefly and compare the VLIW and superscalar models with respect to instruction level parallelism.

5. **Scavenger Hunt:** There is a pub in Ivrea, Italy named after a king of Italy during the Ottonian dynasty (962-1024) that lends its name to a family of popular single-board microcontrollers.

- a. What is the name of the king?
- b. What is the name of the single-board microcontroller?

- c. How has this microcontroller taken “open source” to a new level?
- d. For what type of users was this microcontroller originally developed?