CS 5744: Software Design and Quality

# FINAL EXAMINATION

Due: **11:59 PM, Monday 12/12/2022**, on Canvas

100 points

Name: \_Gasser Ahmed\_\_\_\_\_\_\_\_

**INSTRUCTIONS**:

This examination is a “take home,” open book, open notes test. Please write up your answers in this file *in the space provided*, generate a PDF version named “final-*yourPID*.pdf”, and upload it to the corresponding Canvas assignment by the deadline shown above. Note the page limits for answers that appear in each question. Please **do not change** the font, type size, or margin settings in the file.

Because of the open-book nature of this examination, you may use any information sources at your disposal (the course text, other textbooks, the web, journal articles, etc.). However, you **may not ask any other person for assistance** in answering any examination questions (whether or not they are involved in the class). Any quotations or significant ideas in your answers that are taken from other sources **must be cited**. A section for references has been added at the end of the examination for this purpose, although you should feel free to leave that section blank if all material is entirely your own. There is also no need to specifically cite references mentioned in the questions themselves.

**Virginia Tech Graduate Honor Code Pledge**

I pledge that this examination has been completed in compliance with the Graduate Honor Code and that I have neither given nor received any unauthorized aid on this examination.

Signature: \_Gasser Ahmed\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (sign or type your name to complete the honor pledge)

1. [30 pts., 1 page limit]

Several definitions of software “quality” have been discussed in class. Answer the following questions about software quality:

1. Why is there no “universal,” generally agreed-on, list of quality attributes?
2. Why is there no single, generally accepted measure of software quality?
3. Why are “indicators” used instead of measuring quality attributes directly?
4. The papers we have read describe software architecture and a number of architectural styles. Using “software architecture” as an explicit part of a system development effort and choosing a specific architectural style in guiding your system design choices provides both advantages and disadvantages.
5. [10 pts., 1 page limit]

Identify the **most significant advantages** conveyed by choosing one well-understood architectural style for your software design. Justify your answer.

1. [10 pts., 1 page limit]

At the same time, Shaw and Garlan acknowledge that most large systems do not cleanly follow a single architectural style, and instead use different styles in places or use hybrid styles. Explain why complex applications seem to defy the use of just one architectural style. Justify your answer, and also reconcile it against the advantages provided by using a single style that you described in part (a).

1. A couple of the group design projects this semester used some version of a client-server architecture as the top-level organizational feature of the design. In *Just Enough Software Architecture*, this style is covered in Section 14.12: “Client-server Style and N-tier”. From the perspective of the material about design and assessment presented in this class, answer the following questions about client-server architectures:
2. [10 pts., 1 page limit] From McCall’s list of software attributes defining quality, identify the five attributes you believe **most benefit** from using a client-server architecture. For each of the five, briefly describe **how** such an architecture improves the attribute.
3. [5 pts., ½ page limit] Identify the **critical features** of a design problem that make it a **good match** for a client-server solution, and **explain why**.
4. [5 pts., ½ page limit] Briefly describe a problem scenario where a client-server architecture would be a **poor choice** and identify **which aspects of the problem** are important in making this judgment.
5. [15 pts., ½ page limit]

One approach to measuring software quality was discussed in Lesson 10: the OPA Framework. In this framework, software quality indicators (SQI’s) are measured. In describing the OPA Framework, Dr. Nance mentioned that scores for SQIs ranged from –5 to +5, and that there was little absolute meaning to this scale. Instead, one must have a history of applying the SQIs to several projects (or many times to one project) so that SQI scores can be compared against each other.

Suppose your organization wishes to adopt an OPA approach to software quality measurement, and they will begin with a project on which you are currently working. If this is the case, the first time SQI scores are calculated for your project, you will have no historical data to compare against, either from this project or from other projects. Explain how this first set of SQI scores can still be used to point out problems with the quality of your current project.

1. Review the Chef-It! design project (<https://nyteknight.github.io/cs5744P1/>).
2. [10 pts., ½ page limit]

Identify and describe the most significant weakness(es) you see in this design.

1. [5 pts., ½ page limit]

Is this design likely to lead to a high-quality implementation? Justify your answer.

**REFERENCES**

Use the space below to include any bibliographic citations to other work to which you refer in your answers, of any.