Answering Essay Questions
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July 2010

This memo describes my expectations and grading standards for examinations in most of my courses. The same standards will be applied by graders (including other instructors) who work with me on these courses.

Some students who should pass on the basis of their knowledge fail because of their weak essay-answering skills. We expect students to be able to parse an essay-style question and write an organized answer. That expectation is not going to change.

In this course, your exam will be based on the list of questions in the Study Guide.

- My typical midterm university exam includes 100 points worth of questions, with 20 points each for long answer questions and 10 points each for short answers. For example, the exam might have 2 long answers and 6 shorts, or 3 long answers and 4 shorts. (These exams run 75 minutes.)

- My typical final exam includes 140 points (such as 4 long answers and 6 shorts). (These exams run 120 minutes.)

- The typical AST final exam includes 3 long answers and 3 short. (The time limit for these depends on the format of the course.)

Having the pool of questions in advance gives you the opportunity to prepare well for the exam. Unfortunately, not everyone prepares effectively. There are common problems in these types of exams. Students often:

- ***Miss the point of the question***, wasting space and time on irrelevant material.

- ***Answer the question the student wished was asked***, instead of the question that was asked. If the student is lucky, s/he gets a few points for parts of the answer that were relevant to the question. It is not uncommon for faculty to realize the student is not answering the question and award a zero without digging through the question to try to find something that is accidentally relevant.

- ***Miss a section (or two) of a multiple-issue question***, losing critical points simply because they don't answer that section (even though the student probably knew the answer).

- ***Are so disorganized that it takes significant work to find relevant material*** in the mass of irrelevancy.

- ***Contain obvious errors that demonstrate that the student doesn't understand the answer.*** This is most common when students study together and one student memorizes an answer written by the other students.

Here are some tips for avoiding these problems and writing great exams.

Preparing for the Exam

- Put together a list of source materials for the exam.

    This includes the relevant chapters of the course textbook and all required readings. Also note any references that were listed as "optional" but recommended. These often provide additional insights that will help you understand the material (including an exam question on the material).

- Get copies of all of the source materials (including recommended readings)

- Create a list of all the key words used in the class. Prepare definitions for each one.

    An exam might not have any questions that specifically ask for definitions, but you will often find it useful to define a term as part of your answer to an essay question.

- Now answer the Study Guide questions.

    No one would prepare to run a race primarily by talking about races with friends, or watching a race on television, or reading about races in books.

    o   To prepare to run a race, you have to practice running.

    o   To prepare to write an exam, you have to practice outlining and answering questions of the kind you will face in the exam.

    Your first attempt for each question should be open book with no time limit. Check your lecture notes AND any other readings.

- AFTER you have tried your own answers, compare notes with friends.

    o   The best way to prepare for these tests is to attempt each question on your own. AFTER you have tried your own answers, compare notes with your friends. I recommend that you study with one or more partners. 3-5 people is a good sized group. 8 is too many.

    o   Working with others will help you discover and work through ambiguities before you take the test. If a question is unclear, send your instructor a note before the test. If you tell the instructor early enough, s/he can fix it. If you wait until the exam to complain, I will not modify or explain the question. By the time of the exam, it is your responsibility to understand every question.

    o   If you find during your preparation session that a question takes too long to answer, ask for advice about that (before the exam) too.

STARTING THE EXAM

- Skim the questions

    o   Get a fast overview of the structure and coverage of the exam.

    o   The study guide will point out some exam questions that are designed to allow variation. For example, you might have to analyze a program that can loop up to N times, but the size of N might vary from one exam to another. Does the exam include one of these? If so, you might have to budget extra time to analyze and answer this.

- <u>Develop a budget for your time</u>
  - All exams are time-limited, but some exams are intended to be easy to finish in the time available; others will be high-pressure.
  - If this is a time-pressured exam, quickly build a time budget for it. For example, if the exam is 100 points long, and you have 60 minutes for the exam, then you must earn 1.67 points per minute. A 20-point essay is worth 12.5 minutes. If you spend more than your budget on one question, you will be short on another one. *The ideal time budget should allow at least 10 minutes at the end of the exam for review.*
- <u>Choose the order of your answers</u>

  In almost every exam, you can answer the questions in any order that you choose.
  - If you are nervous, start by answering the question you find easiest. Then the second-easiest, and so on. By the time you have reached the harder questions, you will probably have relaxed enough to remember the relevant material.
  - If you are not so nervous, answer questions in any order that seems sensible. For example, some students tend to spend too long on short answer questions. They should answer long essays first and cram in their short answers at the end, when time pressure is more obvious.

ANSWERING THE QUESTIONS

- <u>Look for the call of the question</u>

  Every well written exam question asks specifically for some information. Your task is to provide the information that the question is calling for, and to <u>not</u> provide information that the question does not call for.
  - Don't answer what has not been asked. For example, if the exam asks you to define one thing, don't define that and then give the definition of something related to it. If you do, (a) your instructor won't give you extra credit, (b) your instructor will probably think you don't know the difference between the two things, and (c) if you make a mistake, your instructor will take off points.
  - Give the number of items requested. For example, if your instructor asks for two scenario tests, don't give one or three. If you give one, you miss points. If you give three, I will either grade the first two and ignore the third (this is my normal approach) or grade the first two that I happen to read (whatever their order on the page) and ignore the third. I will never read the full list and grade what I think are the best two out of three.

  The call of the question is usually identified with a question mark or a directive.

  Consider this example:

  ```
  SoftCo publishes software. Their president hates Easter
  Eggs and has instructed the test group to find every one
  (if there are any) in the product it is testing. As lead
  tester, it is your task to figure out how to test for
  ```

> ```
> Easter Eggs and when to declare the job done. How will you
> decide when you have finished this task? Present your
> ideas, their strengths and weaknesses.
> ```

This question includes the following background information:

> ```
> SoftCo publishes software. Their president hates Easter
> Eggs and has instructed the test group to find every one
> (if there are any) in the product it is testing. As lead
> tester, it is your task to figure out how to test for
> Easter Eggs and when to declare the job done.
> ```

Some people think this question requires you to describe how to test for Easter Eggs, but where does the question actually ask for that?

What the question asks for is this:

> ```
> How will you decide when you have finished this task?
> Present your ideas, their strengths and weaknesses.
> ```

The first sentence ends with a question mark. (Answer the question, please.) The second gives you a specific task that you are supposed to do right now. (So do that task.)

- Be aware of the meaning of the question's words and answer appropriately. For example, these are typical meanings of some frequently used exam words:

  o Compare: When you compare two things, point out (and perhaps explain or describe) similarities between them.

  o Contrast: When you contrast two things, point out (and perhaps explain or describe) differences between them.

  o Compare & Contrast X and Y: These questions require you to describe what is similar between X and Y (compare X and Y) and what is different (contrast X and Y).

    - In a long answer question, I expect three points of comparison and three points of contrast.

    - In a short answer question, I expect a total of three points including at least one comparison and at least one contrast.

    - The question does NOT require you to provide definitions of X or Y, but providing these definitions will often help you write a clearer and more concise answer. If an exam question is worth 20 points (a long answer question, in my grading structure), I will allow 21 or 22 points, giving the extra points to definitions. You can get a full 20 points without the definitions but (to encourage you to write this way), I make a high score easier if you include the definitions.

    - **I follow the same general rule (extra points for definitions) in many other types of questions, because answers are so often so much clearer if they start by clarifying their terms.**

  o List: When you provide a list of items, write briefly, using only one or a few words per item. No explanation of the items is needed.

- Identify: Same as list.
- Describe: A description of something attempts to give the reader a picture of it. A description of a process is often chronological, explaining the steps of the process in order. A description of an abstract concept includes details (perhaps examples) that make it easier for the reader to understand or imagine.
    - If you are asked to describe the relationship among things, you might find it easiest to work from a chart or a picture. You are probably not required to use a diagram or chart, but many professors will welcome it if it helps you get across your answer.
    - If the question asks you to describe or define something that is primarily visual (such as a table or a graph), your answer will probably be easier to write and understand if you draw an example of what you are defining or describing.
- Define: Provide the meaning of a word or phrase. Some teachers expect formal definitions. I just want you to describe the concept behind the word. Use examples if they help you clarify the definition.
- Analyze: Normally means, to break a concept or process or set down into component parts and discuss the relationships among the components. Sometimes you are asked to analyze in a specific way, such as "analyze the impact of X on Y." In this example, you might explain the effects of X (and the components of X) on Y.
- Explain: Help the reader understand something. Explanations often focus on "why" or "how".
- Evaluate: Discuss something in a way that allows you to reach a judgment (a conclusion) about it. In your answer, explain the rationale behind your conclusion. In a mathematically or formally oriented question, "evaluate" might mean to work through the formal material in order to reach the result. (Think of evaluating an expression.)
- Argue: Pick a position in a debate or controversy, state it, and provide a series of arguments that support your position.
- Discuss: This is a vague word. It is often intended as an open question, inviting you to choose the best way to address the question. For example, "Discuss the effect of X on Y" might be best addressed as "Describe and explain the effect of X on Y". If the relationship between X and Y is controversial, then "discuss" invites you to present multiple viewpoints and the data that support them.

If I ask you to analyze something according to the method described in a particular paper or by a particular person, I expect you to do it their way. If I ask you to describe their way, do so. If I ask you to apply their way, you don't have to describe it in detail, but you must do the things they would do in the order they would do them, and to use their vocabulary to describe what you are doing.

If the question asks you for the result of a calculation, such as the number of paths through a loop, show your calculations or explain them. Let your instructor understand how you arrived at the answer.

- Outline your answer:
  - Unless your answer will be trivially simple, develop a structure for the information that you will provide.
  - Often, the best outline explicitly connects to the question, using the key words in the question.
  - The outline should explicitly cover every issue raised in the question.
  - If the question contains multiple parts, make a separate section for each part.
- **An example:**

  Define the characteristics of a "good test" and a "bad test." Explain the differences, why good is good and why bad is bad. Provide and justify a definition of a good tester.

  In analyzing a question like this, it is essential to look for the *call of the question* -- the specific issues you are being asked to address:

  - *DEFINE* the characteristics of a good test
  - *DEFINE* the characteristics of a bad test
  - *EXPLAIN THE DIFFERENCES:* why good is good and why bad is bad
  - *PROVIDE and JUSTIFY a definition of a good tester.*

  Many answers failed because they simply omitted some parts of this question. For example, several answers failed to contract good versus bad tests. Others failed to *justify* the definition of a good tester.

- Structure your answer according to the outline AND SHOW THE STRUCTURE:

  The general rule (based on research of graders in several fields) is that a paper that is easy to read and obviously well organized will often be seen as more credible and will get more points than one with equally good content but poorer presentation. Often, the increase in grade goes beyond the instructor's intended allowance for "style". Make this work for you, instead of against you.

  - Make your organization of the answer easily visible to the grader.
  - For example, use the structure of the outline as headings.
  - If the question contains multiple parts, make a separate section for each part. Provide a heading for each section, or use bulleted lists, to emphasize your structure.
- **Example:**

  "What is the difference between black box and white box testing? Describe the advantages and disadvantages of each."

  You could organize this with five headings:

- o Difference between black and white
- o Advantages of black box
- o Disadvantages of black box
- o Advantages of white box
- o Disadvantages of white box
- ▪ **Example**:

   ```
   Compare and contrast two lifecycle models. What advantages or
   disadvantages does each model have over the other?
   ```

   Some students circle or underline keys words in a question like this, and use arrows to highlight relationships. They check off circles and arrows as they answer that part of the questions. A marked-up version of this question might look like:

   ```
   [Compare and contrast] two [lifecycle models.]  What advantages
   or disadvantages does [each model] have [over the other]?
   ```

   This works well for some people. I sometimes find it too concise so I might create a list of the elements of a multi-part question:

   - o Compare two lifecycle models
   - o Contrast two lifecycle models
   - o What advantages does each model have *over the other*?
   - o What disadvantages does each model have *over the other*?

   This list (4 points) defines the call of the question. It specifies what information is requested (called for).

   - o Notice that you have NOT been asked to define a lifecycle model (or a model in general)
   - o Notice that you have NOT been asked for empirical research results
   - o Notice that you have NOT been asked for a longer list of models -- just two, please.
   - o Notice that when you describe an advantage of one model, it should be an advantage OVER THE OTHER For example, suppose you contrast spiral and evolution. Both of these have a common advantage over the waterfall model-- they both expect requirements to change over time and have sensible ways to deal with change, whereas the waterfall does not. HOWEVER, even though the ability to cope with changing requirements is an advantage for any incremental process over waterfall, it is not clear that spiral has this as an advantage over evolution (or that evolution has this as an advantage over spiral). You have to explain what makes spiral better than evolution and what makes evolution better than spiral.
- ▪ Provide appropriate amounts of information or detail.

- o If a question asks about "some", that means at least two. I normally expect three items in response to a "some". Similarly if the question asks for a list, I expect a list of at least three.
- o If I ask you for the result of a calculation, such as the number of paths through a loop, show your calculations or explain them. Let me understand how you arrived at the answer.

GROUND RULES

- You may not use any reference materials during the exam.

  You may not consult your notes, web sites, any materials on the course web site, or any other source of information.

- Beware of simply memorizing.

  Beware of memorizing someone else's answer or points off a slide. If I think you are giving a memorized list without understanding what you are writing, I will ruthlessly mark you down for memorization errors. In general, if you are repeating a set of bullet points, write enough detail that I can tell that you understand them.

- Deal with confusion and ambiguity before the exam starts.
  - o One of the advantages of circulating the questions in advance is that the students can challenge them before the exam. Surprisingly, a question might be perfectly clear to the students in one semester but ambiguous to the students in the next semester.
  - o I encourage students to draw ambiguities to my attention. I resolve the ambiguities by sending an electronic mail message to the course (rather than giving an answer only to one student). I may exclude the question from the exam if the correction came too late or the answer to the corrected question is too complex.
  - o I will not answer questions about the meaning of an exam question during the exam. By the time you come to the exam, you should have studied the questions already and cleared up your confusions.

A CLOSER LOOK AT SOME COMMON PROBLEMS

Structure

Consider the following question as an example:

```
Define a scenario test and describe the characteristics of a good
scenario test. Imagine developing a set of scenario tests for the
Outlining feature of the word processing module of Open Office.
What research would you do in order to develop a series of scenario
tests for Outlining? Describe two scenario tests that you would use
and explain why each is a good test. Explain how these tests would
relate to your research.
```

This has several components:

- Define a scenario test
- Describe the characteristics of a good scenario test
- What research would you do in order to develop a series of scenario tests for Outlining?
- Describe two scenario tests you would use.
- Explain why each of the two scenario tests is a good test
- Explain how these two scenario tests would relate to your research

A well organized answer to this question will have at least six sections, one for each of the bulleted components. You might have two additional sections, by splitting

- Describe two scenario tests you would use and
- Explain why each of the two scenario tests is a good test

into two sections, one for each test.

Without structure, it is easy to miss a section and thereby to lose points.

Shotgun Answers

A student using a shotgun strategy responds with a core dump of everything that seems relevant to the general topic. Much of this information might be correct, but if it is non-responsive to the call of the question, it is irrelevant and I will ignore it. However, to the extent that irrelevant information is incorrect, if I notice an error, I will deduct points for it.

This is a common strategy for dealing with shotgun answers--ignore irrelevant material unless it is wrong. If it is wrong, deduct points for the errors.

Here's an example of a question that appeared several times in the Florida Tech software engineering comprehensive exam:

```
What is the most expensive phase in software engineering?  Justify
your answer
```

Parse the question:

- What is *THE MOST EXPENSIVE PHASE* in software engineering?
- *JUSTIFY* your answer.

It should be obvious that you are being asked to talk about ONE phase.

It should also be obvious that most of the points for the answer to this question will be in the justification of your choice.

In Florida Tech's software engineering comprehensives, several failing answers wrote about several phases instead of the one the student considered consider the most expensive. In these cases, we assigned grades based on the first phase mentioned by the student and ignored anything said about any of the other phases.

Some of the answers got so muddled up in outlining costs across the lifecycle that the student never drew the conclusion as to which is the *most* expensive phase. Without that,

nothing in the answer "justified" the answer that was never provided. These answers earned low grades, sometimes as low as zero.

Here's another example, from Florida Tech's CSE3415 (Software Testing 1):

```
Imagine that you are an external test lab, and Sun comes to you
with Open Office. They want you to test the product. When you ask
them what test documentation they want, they say that they want
something appropriate but they are relying on your expertise. To
decide what test documentation to give them, what questions would
you ask (up to 7 questions) and for each answer, how would the
answer to that question guide you?
```

This question asks what **test documentation** you will give them.

- Where does this question ask how you will **test** the product?

- Where does this question ask about software that controls medical devices and how to document the testing of that software? Or games? Or databases?

- Where does this question ask about the relationship between Sun and Oracle, or about Sun's computers or about the platforms on which Open Office runs, or about the consumer documentation that you can buy for Open Office? Perhaps these could be relevant to the question, but only if you tie them carefully to this exam question's actual focusing task (describe up to 7 questions that will help you decide what test documentation you will provide and explain how the answers to these questions would help you make those decisions).

People often provide irrelevant information because they don't have a good answer to the question that was asked and so they are answering the question they know the answer to. This might work in some courses but it is a failing strategy in my courses. Similarly, at work as a technical worker (such as programmer or tester), if you try to avoid direct questions by giving irrelevant answers, your reputation is likely to suffer.

Weak Group Preparation

The best way to prepare for these tests is for each student to attempt each question on his own. The first attempt should be open book with no time limit. After each student has his own answers, he should compare notes with other students. The diversity of approaches will highlight ambiguities in the question, hidden assumptions on the part of the student, and muddled, disorganized thinking about the structure and call of the question. Independent preparation by several students is essential.

Unfortunately, many students form study groups in which they either:

- Divide up the questions. One or two students attempt to answer each question and then report back to the group. The rest of the students then attempt to memorize the answers.

- Or, attempt to develop the answers in-group, four or more students arguing and together.

Neither of these approaches works well. There are so many questions in the study list that few (or no) students can effectively memorize all the answers. As a result, I often see

answer fragments, relevant material mixed with irrelevant (something memorized for a different question), or answers that have been distorted (such as forgotten words, points made so far out of sequence that they don't make sense, etc.)

Participating in a group-writing meeting works better than simply memorizing answers, but often produces weak answers. The group tends to latch onto the first answer that appears to make sense. Or it latches onto the answer advocated by the loudest or most persuasive or most persistent student in the group.

It is much more effective to start from a diverse group of prepared answers, with the people who understand and can explain why they prepared the answers in the way they did.

I tell students this every term, and every term a significant group of students tries the divide-and-(oops)-don't-conquer strategy and the work-only-during-group-study sessions. Most learn their lesson the hard way when they write an unsatisfactory mid-term exam.

Weak Answers Propagate Through the Group

Sometimes, the entire class answers a question in a way that is obviously (to me) mistaken or otherwise sub-optimal. I've seen several class-specific exam answers like this. By class-specific, I mean that a different class, on encountering the same question, has handled it much better.

Failure to Consult Required Readings

Surprisingly often, students consult the course's lecture slides but ignore the videos and/or required readings. Some questions in the study guide rely on the required readings and not on the lecture slides. Students who don't consult the readings give poor answers.

A more subtle problem arises when a question can be answered to a mediocre degree from the lecture notes, and much better from the required readings. In that case, the large majority of the class often gives the mediocre answer.

GRADER: This illustrates a problem you must avoid. It is tempting to the grader to accept the majority product as the right product, but on these questions, the answer of the majority of students is often unacceptably poorly researched.

NOTES FOR GRADERS

Some commonplace causes of grading inconsistencies include:

- *Hunting for points*. An answer can be so disorganized or so riddled with errors that the grader has to read carefully and generously to find statements that are relevant and correct. There is a limit to this. It's important to grade what the student wrote, not what the student might have meant. It's reasonable to give up on understanding an answer (or part of one) and to award few points or none.

  If you're not sure about an answer, or if you are taking too long to grade an answer, make notes on a separate piece of paper, assign a tentative grade with those notes, then ask someone else (another grader) to read the answer (without your notes) and tell you how they interpret it.

- **Ignoring errors.** A weak answer will often contain factual errors or erroneous (or ridiculous) arguments or claims. Some are directly relevant to the question that was asked. Others are irrelevant, but still wrong.

  The standard on this issue might vary from course to course, but it is important to settle on a common standard for all the graders in the same course. The "typical" rule is that errors count against the grade, whether they are relevant to the question that was asked or not.

- **Over-penalizing for (or ignoring) weak organization and style..** An answer can have excellent content but be presented poorly. How much should it be downgraded?

  This will vary from course to course. Style and organization count for more if the course's learning objectives include teaching technical writing skills. However, within a course, these factors should be called out explicitly. If style and organization count for 10% of the grade, take off the 10% for a badly-written answer but focus the **rest** of your grading on the content. If style and organization are distracting you from the content, make separate notes on style/organization and content, assign a tentative grade, then ask another grader to read the answer (without your notes) and tell you how they interpret the content.

- **Over-penalizing for spelling errors.** If your course includes students who speak English as a second language, how much should you penalize them for spelling errors or grammar errors that are typical of native speakers of other languages?

  The "typical" rule is that these errors have a small impact on the grade.

- **Expecting more than was asked.** The creator of a question might expect students to answer it in a certain way, or to include certain types of information, but sometimes the question doesn't unambiguously call for that information.

  It must be possible for a student who answers exactly and only what was asked to get full points for an answer.

- **Ambiguity in the question:** Sometimes, students can **reasonably** read a question as having two meanings or calling for two different sets of information.

  A question that *seems* unambiguous to you might still be ambiguous. If you're not sure, ask a colleague. If the question is in fact ambiguous, and if the alternative reading is reasonable (for example, it doesn't distort or trivialize the question in a way that should alert the student that this can't be the right meaning), then it must be possible for a student who answers what a reasonable reader would agree was asked to get full points for the answer.

  Sometimes a question might seem ambiguous because several students answer it in the same wrong way. The question may or may not actually be ambiguous. Sometimes a study group collectively develops a bad answer and all the students in the group then blow that question on the exam.

If you are grading within the Association for Software Testing series of courses, we are developing additional grading-support resources for you beyond these public notes. If you

have trouble grading a question, ask your grading group, or look for additional notes on the AST instructional support site.

RESOURCES

There are plenty of online resources for students who are learning how to write essay exams, such as:

- University of Wisconsin-La Cross (Department of Biology), "Answering Essay and Short Answer Exam Questions", http://www.uwlax.edu/biology/communication/AnsweringEssayQuestions.htm
- Purdue Online Writing Lab (OWL), "Writing Essays for Exams", http://owl.english.purdue.edu/owl/resource/737/01/
- Joe Landsberger, "Terms or Directives for Essays, Reports, & Answering Questions", Study Guides and Strategies, http://www.studygs.net/essayterms.htm
- Writing@CSU, "Writing Guide: Answering Exam Questions," http://writing.colostate.edu/references/processes/exams
- Student Academic Resource Center, University of Central Florida, "Answering Essay Questions Made Easier", http://sarc.sdes.ucf.edu/ss50.pdf
- Martha Peters, "Exam Preparation," University of Iowa College of Law Academic Achievement Program, http://www.uiowa.edu/~aap001/ExamPreparation.htm

I created a video with a detailed example of the grading style presented in this memo, grading four very different answers to one question:

- How we grade essay exams (Part 1), http://www.testingeducation.org/BBST/videos/BBSTGradingFirstSet.wmv
- How we grade essay exams (Part 2: comparative grading of four exam answers), http://www.testingeducation.org/BBST/videos/BBSTGradingSecondSet.wmv
- How we grade essay exams [Slides], http://www.testingeducation.org/BBST/slides/Grading%20Essay%20Exams.pdf

It is a good idea to create an outline of your answer before writing out the complete answer. This will help you clarify and focus your thinking.

- Purdue University's Online Writing Lab's useful tutorial on writing a research paper includes excellent information on the how and why of outlines.
- For more information on outlines, please visit this web page on outlines from Indiana University.