

>>> SOLUTIONS <<<

Welcome to your 10% exam for Senior Project. The time for this exam is 60 minutes. The exam is open book and notes, but you may *not* receive or give help from or to another person. *Carefully follow instructions*. If a question states to “State your answer in two sentences.” this means that only the first two sentences of your answer will be read and graded. If you copy the answer directly out of the textbook (or some other source), be sure to properly “quote” the answer (otherwise it is assumed that any answer is given in your own words). There are 8 questions, each one worth 12 points (there are 4 points in this exam just for filling-in this cover sheet and submitting it on top of your answer sheets). Answer problem #'s 1, 3, 4, 5, 6, 7, and 8 *on a separate sheet of paper* for each problem, answer problem #2 on this page.

Problem #1

Answer the following questions about the product development process...

a) Give the product development process “flow chart”.

Requirements -> Specification -> Design -> Implementation -> Test -> Manufacture -> Distribution -> Maintenance -> End-of-life. Feedback from Test to Design (verification) and Test to Requirements (validation).

b) Give three reasons that teams are used in industry

Here are five reasons...

- 1) Minimize effects of people leaving
- 2) Prevent “blackmail” by a single indispensable person
- 3) Allow for a balancing of skills
- 4) Allow for training (apprenticeship style)
- 5) Synergy of multiple brains

c) Describe the ideal programming team as envisioned by Brooks in *The Mythical Man Month*

Chief programmer, co-pilot to chief programmer, administrator, editor, secretaries, toolsmith, tester, and language (also spec) lawyer

Problem #2

Fill-in the blanks (one word per blank unless otherwise stated).

a) Every measurable aspect of a “device” should be covered in the specification

b) A specification must be traceable to the requirements

c) A great generic (not specific) example of a specification is a standard

d) A design needs to convey what are the inputs, outputs, data, and transformations on the data (algorithms) (the last blank is a phrase).

e) Verification – Does it “work” as described in the specification.

f) Validation – Does it “work” as described in the requirements.

g) Each test case in a test plan must be traceable to both the specification and requirements documents

h) In Hungarian notation (used by Microsoft), the variable name `iCounter` denotes an integer type variable

- i) The second slide (or somewhere close to the second slide) in a presentation should be an acknowledgments slide
- j) The first sections of a resume (after your name and contact information) as taught in this class are objectives, education, skills, and experience.
- k) A press release must cover the “5 W’s and 1 H”. Give the 5 W’s and 1 H: Who, What, Where, When, Why, and How.

Problem #3

One of your final deliverables is a poster. Answer the following questions regarding posters.

- a) Sketch the basic layout of a poster.

A poster layout is...

- ?? Left side should have problem statement and requirements.
- ?? Right side should have specification and design / implementation.
- ?? Center top should have title, contact, and acknowledgment information.
- ?? Center bottom should have visuals (pictures, graphs, etc.) references in the problem, requirements, etc.

- b) What is the rule on “artistic embellishments” in the poster (also presentation slides)?

Are you an artist? Is this art class? If the answer is “no”, then that too is the answer on any artistic touches (such as fancy backgrounds, filigreed borders, and so on). Art is “fluff” in an engineering presentation.

- c) What is a good rule of thumb for font and picture sizes?

The poster should be readable and understandable from a few feet (say, three feet away). Thus, font size 18 or 20 points is probably good. 10 points is surely too small and 48 points surely too large.

Problem #4:

What is the mythical man month (as described by Brooks)? Describe how adding people to a late project will usually make it even later. Be very precise and complete in your answer. Do not simply write your answer as a restatement of the question.

Cost varies as the product of men (of either gender) and time, however progress does not. Only if a job can be partitioned with no communications between people, can men and months be interchanged. An example: picking cotton. If communications is required or if a task has a sequential component (classic example of sequential: “the bearing of a child takes nine months, no matter how many women are assigned” - Brooks) men and month do not interchange. Programming has both sequential aspects (e.g., debugging) and communications between team members of interfaces and other technical matters. Thus, by adding people to a project where communications is required, the overhead from the additional communications may exceed the productivity gain causing forward progress to be further reduced.

Problem #5:

In *The Mythical Man Month*, Brooks discussed aristocracy versus democracy as it applies to developing computer programs. Describe when and where “aristocracy” should hold and when and where “democracy” should hold.

In the chapter “Aristocracy, Democracy, and System Design” Brooks discusses that there should be few architects (the aristocracy that makes design decisions that live longer than an implementation and that must be controlled), but implementation should be democratic where many skillful minds can contribute ideas and technical brilliance.

Problem #6:

In *The Mythical Man Month*, Brooks says “Beyond craftsmanship lies invention, and it is here that lean, spare, fast programs are born. Almost always these are the result of strategic breakthrough rather than tactical cleverness.” What is meant by this? Give an example.

In the chapter on squeezing ten pounds in a vice-pound sack Brooks describes that a strategic breakthrough can be a new algorithm. For example, an $O(n\log(n))$ sort instead of an $O(n^2)$ sort. Tactical cleverness might entail assembly language tuning parts of a $O(n^2)$ sort, but this will never beat an even poorly written $O(n\log(n))$ sort for any interesting size of n .

Problem #7

List five significant things you have learned from the guest presentations. Each item listed should not exceed four sentences and should be for a different presentation (i.e., you may not list multiple items for a single presentation). Frivolous or trivial answers will not be accepted (for example, stating that you learned that Sonny’s BBQ is test marketing pulled pork in their restaurants is NOT a good answer). Be sure to identify the speaker and/or company in all cases.

To be graded individually.

Problem #8

Answer the following questions to help me ~~z~~ (please try to write thoughtful and non-trivial answers)...

a) Describe one good thing about this course.

To be graded individually.

b) Describe one bad thing about this course.

To be graded individually.

c) Describe how to correct the “bad thing” you described in (b).

To be graded individually.

d) State at least two things you have learned in this course.

To be graded individually.
