EECS 448: Software Engineering I

Midterm Exam - Spring 2018

Monday March 12, 2018
Timeslot: 8:00am - 8:50am CDT
Duration: 50 minutes

There are **25** questions in this exam.

*This exam is closed-book and closed-notes**
**Students are allowed to bring in ONE "note sheet"*
(one letter-size or A4 sheet: handwritten or typed)
NO electronic devices are allowed

Use the back of the page if more space is needed.

Name:

Please sign the following honor pledge.

On my honor, as a student, I have neither given nor received unauthorized aid on this academic work.

Signature:

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. (2 pts per question)

1) Which of the following statements indicate the extent of the impact of software on society? 1) _____
A) Software is embedded in cars and appliances.
B) Services are delivered on demand using the Internet and mobile devices.
C) Social media has become pervasive of our everyday activities.
D) All of the above

2) Software deteriorates rather than wears out because 2) _____
A) Defects are more likely to arise after software has been used often
B) Multiple change requests introduce errors in component interactions
C) Software spare parts become harder to order
D) Software suffers from exposure to hostile environments

3) Which is a reasonable approach when requirements are well defined? 3) _____
A) The waterfall model of software development
B) The prototyping model of software development
C) The incremental model of software development
D) The spiral model of software development

4) The spiral model of software development... 4) _____
A) Ends with the delivery of the software product.
B) Includes project risks evaluation during each iteration.
C) Is more chaotic than the incremental model.
D) All of these.

5) Which of these is not an element of a requirements model? 5) _____
A) data elements
B) scenario-based elements
C) behavioral elements
D) class-based elements

6) UML activity diagrams are useful in representing which analysis model elements? 6) _____
A) flow-based elements
B) scenario-based elements
C) behavioral elements
D) class-based elements

7) Identify poor reasons for developing a requirements model. 7) _____
A) describe customer requirements
B) establish basis for software design
C) define set of software requirements that can be validated
D) develop an abbreviated solution for the problem

8) The first step in project planning is to 8) _____
A) select a team organizational model
B) determine the project constraints.
C) determine the budget.
D) establish the objectives and scope

9) The purpose of the state diagram is to 9) _____
A) indicate how data are transformed by the system
B) depict functions that transform the data flow
C) indicate system reactions to external events
D) depict relationships between data objects

10) Evolutionary software process models... 10) _____
A) Are iterative in nature.
B) Do not establish the maximum speed of the evolution.
C) Can easily accommodate product requirements changes.
D) All of these.

TRUE/FALSE. Write 'T' if the statement is true and 'F' if the statement is false. (2 pts per question)

11) Software processes can be constructed out of pre-existing software patterns to best meet the needs of a software project. 11) TRUE

12) Software is a product and can be manufactured using the same technologies used for other engineering artifacts 12) FALSE

13) In agile process models the only deliverable work product is a working program. 13) FALSE

14) The essence of software engineering practice might be described as: understand the problem, plan a solution, carry out the plan, and examine the result for accuracy. 14) TRUE

15) A good software development team always uses the same task set for every project to insure high quality work products. 15) FALSE

RIGHT SEQUENCE. Choose the options that best complete each statement or answer the question.

16) Place the 5 generic software engineering framework activities in the order they would normally occur during a software development project. (4 pts) 16) ADEBC
A) communication
B) construction
C) deployment
D) planning
E) modeling

17) Which of these software characteristics are used to determine the scope of a software project? (3 pts) 17) BCDE

A) communications requirements
B) context
C) function
D) information objectives
E) performance
F) software platform

18) The W5HH principle contains which of the following questions? (3 pts) 18) ACD

A) Why is the system being developed?
B) What will be done by whom?
C) Where are they organizationally located?
D) How much of each resource is required?

SHORT ANSWER Write your answer in the space provided or on a separate sheet of paper. Your answer should not be longer than one paragraph. (6 pts per question/requirement)

19) Describe the XP concepts of refactoring and pair programming in your own words.

Refactoring is the process of changing a software in such a way that it does not alter the external behavior of the code yet improves the internal structure.

Pair programming: XP recommends that two people work together at one computer/workstation to create code for a story. This provides a mechanism for real-time problem solving and real-time quality assurance.

20) Describe what an analysis pattern is in your own words.

An analysis pattern - a solution to a previous modeling problem that can bu reused in a similar situation.

OR Analysis patterns suggest solution(e.g. a class, a function, a behavior) within the application domain that can be reused when modeling many applications

21) Conduct a grammatical parse of the following user story and enumerate/list the potential class operations:

Citizens can log onto a website and report the location and severity of potholes. As potholes are reported they are logged within a "public works repair system" and are assigned an identifying number, stored by street address, size (on a scale of 1 to 10), location (middle, curb, etc.), district (determined from street address), and repair priority (determined from the size of the pothole).

In general, identify the verbs in the user story: logon, report, log, assign, store.
Operations can be divided into four broad categories:
• Operations that manipulate data in some way (e.g., adding, deleting, selecting)
• Operations that perform a computation
• Operations that inquire about the state of an object, and
• Operations that monitor an object for the occurrence of a controlling event.

22) Distinguish between a responsibility and a collaborator in a CRC model.

Stated simply, a responsibility is “anything the class knows or does.”
A collaboration implies either a request for information or a request for some action.

23) Differentiate UML state diagrams from UML sequence diagrams.

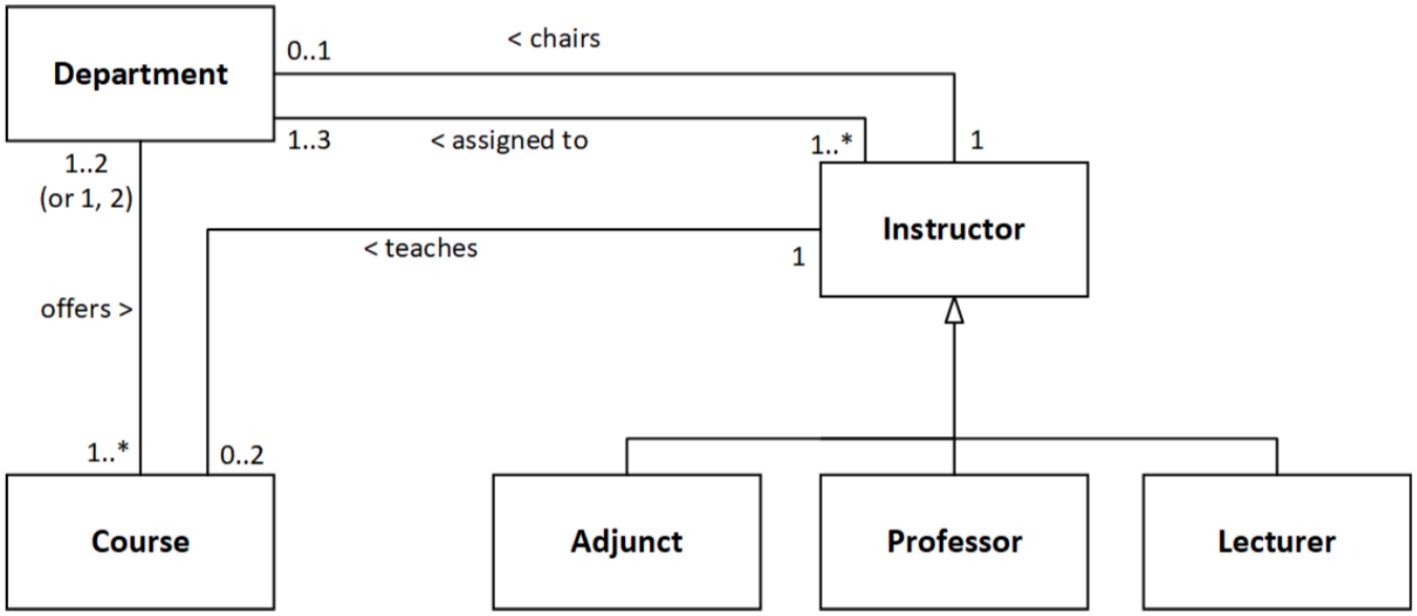
A sequence diagram captures how events cause the flow from one object to another object as a function of time. (It shows the dynamic communication between objects to complete a task and the temporal order in which messages are sent.)
On the other hand, a state diagram indicates how an individual class changes state based on external events.

DIAGRAM. Draw the corresponding diagram or answer the questions related to the pictured diagram.

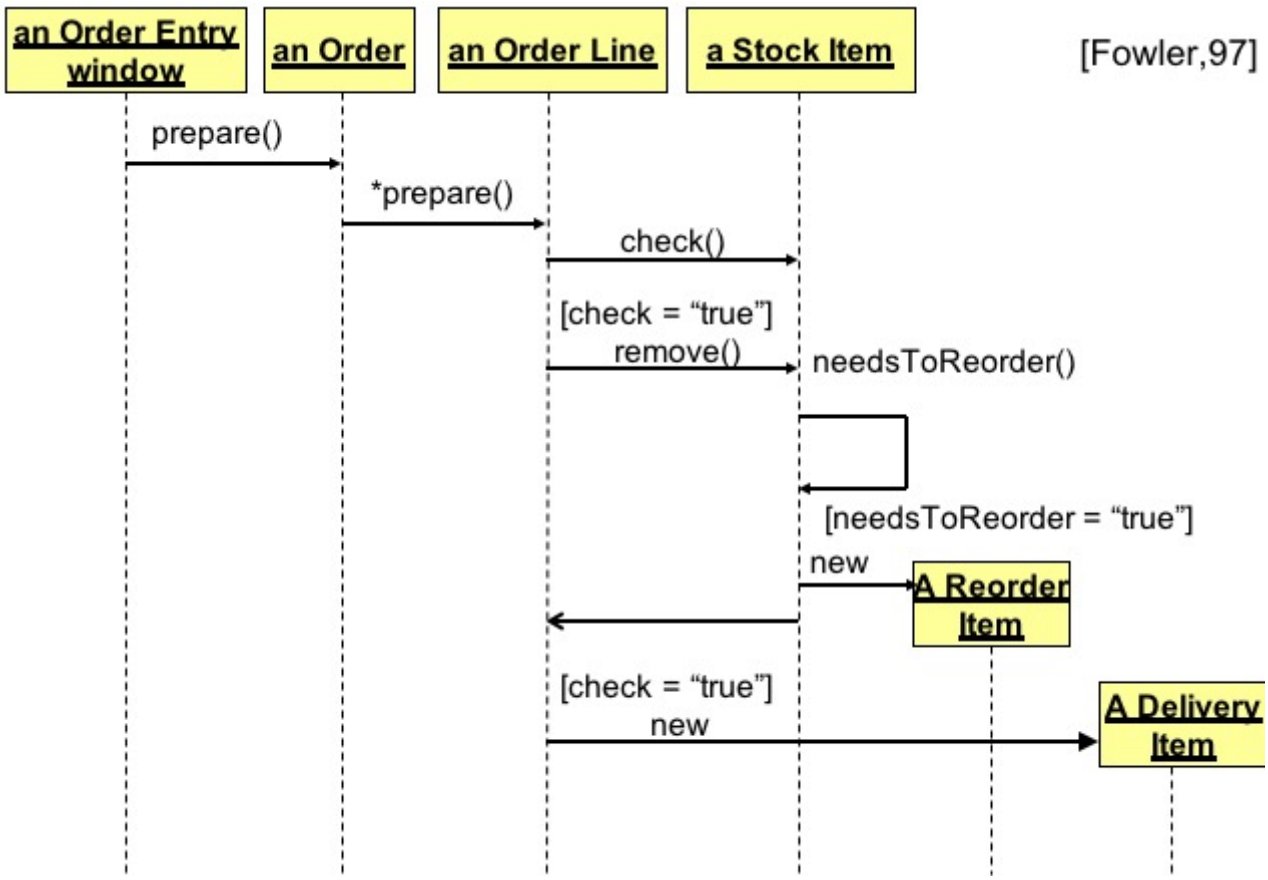
24) Based on the following "University Courses" description, draw the corresponding class diagram. Include class names, relationships between classes, relationship names (with direction), and multiplicities. (20 pts)

University Courses:
- Some instructors are professors, some are lectures and some are adjuncts.
- Departments offer many courses, but a course may be offered by no more than two departments
- Courses are taught by instructors, who may teach up to two courses
- Instructors are assigned to at least one and no more than three departments
- One instructor also serves as department chair
- A department can have only one department chair

Rough points distribution: 6p for identifying the classes, 8p for multiplicities, 3p for labeling relationships, 3p inheritance structure


Department
0..1
< chairs
1..3
< assigned to
1..*
1
1..2
(or 1, 2)
offers >
< teaches
1
Instructor
1..*
0..2
Course
Adjunct
Professor
Lecturer

25) Based on the diagram below, answer the following questions and requests.



a) What type of diagram is it? (1 pt)

Sequence diagram

b) Enumerate the objects pictured in the diagram. (3 pts)

an Order Entry window, an Order, an Order Line, a Stock Item, A Reorder Item, a Delivery Item

c) What is the difference (from a behavioral perspective) between the two *prepare* messages in the diagram: prepare() and *prepare()? (2 pts)

* denotes an iteration

d) Under what condition will a Stock Item be removed? (2 pts)

[check = "true"]

e) Indicate the "message creations" in the diagram? (2 pts)

new: A Reorder Item, new: A Delivery Item