CS3733: Software Engineering – B00
Midterm Exam

Name:

Question	Poss. Points	Grade
1	15	
2	20	
3	20	
4	15	
5	15	
6	15	
	Total	

Answer all questions in the spaces provided on this exam. If you need additional space, get blank paper from the professor. Clearly label all answers on additional sheets with their corresponding question number.

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1. (15 pts) Your company is developing software for an on-line stock-trading service. The software contains the following subsystems: a database of stockholder accounts, a web-based client through which customers place orders and request stock prices, an ordering server which processes stock transactions as requested by clients, and a networking system for communicating with an external stock price server (for up-to-the-minute stock prices).

   For each of the following test cases, indicate whether it should be run during unit, integration, or system testing. If you feel a test should be run in more than one testing phase, state the phases and justify your answer.

   (a) Assuming the server is up, do stockholders receive price quotes within 3 seconds even if 200 stockholders request quotes simultaneously?

   (b) Does the ordering server accept an order only if the stockholder's account has sufficient funds to cover the order?

   (c) Does the client refuse orders for stocks that do not exist?

   (d) If the server receives an order to purchase stock and the stockholder has sufficient funds, is the stock eventually purchased?

   (e) Once a stockholder's account has been removed from the account database, is that stockholder prohibited from placing orders through the software?

The next three problems work with the following two use cases for a software system for managing restaurant services. There are three (disjoint) kinds of humans involved in this scenario: Waiters, Chefs, and Customers. Each waiter uses a wireless handheld device (like a Palm Pilot) to communicate with the chefs. Waiters enter Customer orders and receive notices that orders are ready through their handheld devices. The given use cases cover placing orders and paying bills.

Use Case Name	PlaceOrder
Part. Actors	Initiated by Waiter
	Communicates With Chef, Customer
Entry Condition	1. Waiter activates the PlaceOrder option on his handheld device, which brings up an order form on the handheld's display
Flow of Events	2. Waiter fills in the table number for the order.
	3. As Customer tells Waiter what she wants to order, Waiter taps on items on order form. If the Customer has special preparation instructions for an item, Waiter selects the CustomizeOrder option and enters the special instructions.
	3. When Customer is finished placing order Waiter submits the order to the Chef. The sent order contains the table number, the Waiter's ID code, the items ordered, and all special instructions.
	4. The order appears on the Chef's display. After the Chef has prepared the order, he selects the InformOrderReady option.
	5. The Waiter's handheld device flashes a message informing him that the order is ready.
Exit Condition	6. The Waiter delivers the food to the Customer, then uses the handheld device to record that the order has been delivered.
Spec. Reqs	The Waiter should receive the notice that the food is ready within 15 seconds of the Chef sending the notice.

Use Case Name	PayForOrder
Part. Actors	Initiated by Customer
	Communicates With Waiter, Printer
Entry Condition	1. Customer asks Waiter for Bill
Flow of Events	2. Waiter accesses unpaid orders for Customer's table on his handheld device and chooses PrintBill option to send the bill to the Printer.
	3. Waiter retrieves bill from Printer, puts it in a holder, and brings it to Customer's table.
	4. When Customer is ready to pay bill, Waiter takes payment and brings change to the Customer.
Exit Condition	5. Waiter enters amount Customer paid (including tip) into his handheld device and closes the open orders for the Customer's table.
Spec. Reqs	

2. (20 pts) Develop an object model for the two Restaurant use cases. Identify the boundary, entity, and control objects that these two use cases require. For the entity objects, identify their attributes and the associations between them. You do not need to identify the methods for any of the objects.

3. (20 pts) Develop a sequence diagram to capture the PayForOrder use case.

4. (15 pts) What use cases would you develop to handle exceptional behavior for these two restaurant use cases? Provide a name and a brief (few words) description for the situation each case would handle. Do **not** write the use cases.

5. (15 pts) Object analysis on a software system has produced the data model and desired operations for filesystems given below. You have been asked to develop an in-house prototype of the system (**not** an interface mock-up). Which operations and what data model would you use in your prototype? Place checks to the left of each operation you would include; for the data model, write down what data you would include and what type you would use for each datum.

(In the class diagrams, date is a tuple <month, day, year> of numbers, time is a tuple <hours, minutes, seconds> of numbers, and access is a tuple <owner, group, all> of booleans.)

File
name : string
size : number
contents : list of symbols or codes or a file
modified : <date, time>
owner : username
group : groupname
type : text, binary, link
permissions : <access, access, access>

Directory
name : string
size : number
modified : <date, time>
owner : username
group : groupname

Operations on directories:

- total-dir-size (Unix du) : returns total size of files in the directory (incl. nesting)
- total-dir-files : counts files in the directory (incl. nesting)
- path-to-file (Unix find) : returns path to a given filename
- files-containing (Unix grep) : returns paths to all files containing given word
- files-owned-by : returns paths to all files with given owner
- files-modified-since : returns paths to all files modified since given date
- sort-files/size : returns list of files sorted by increasing size
- sort-files/owner : returns list of files sorted alphabetically by owner
- sort-files/group : returns list of files sorted alphabetically by group
- sort-files/mod-date : returns list of files sorted by most recent modification date

6. (15 pts) Assume you are the lead software engineer on a system that will work with several hardware devices to administer doses of radiation to cancer patients.

(a) (5 pts) Your testing team asks you for two extra weeks so they can develop a set of test cases that will *guarantee* that the software never authorizes a radiation overdose (ignore possible hardware failures for this question). Do you believe this is a good use of your testing team's time? Explain your answer.

(b) (10 pts) Late in system testing, your team discovers a case in which your software will authorize a radiation overdose to a patient. Fixing the bug will require re-partitioning several subsystems and re-implementing substantial parts of the system. You are already close to the product delivery date and have exhausted the contracted budget. You must decide whether to redesign your product to fix the bug. List at least three groups (from within and outside the company) that you should talk to in making this decision. For each group, list at least two questions that you would ask its members to help you make this decision.