CS 320, Spring 2016 — April 18th — Exam 2   Name: _____

This is a take-home exam:

- The exam is to be completed individually. Do not discuss any of the questions with any other person.
- Do not use any resources other than your notes, the assigned textbooks, and the resources explicitly linked from the course web page.
- Express your answers in your own words.
- You must create an electronic version of your exam answers. Use Violet UML to create the class diagram for Question 1 and embed the UML diagram in your submission.
- Your name should appear on each page of your submission.
- Turn in a hard copy of your completed exam at the beginning of class on Monday, April 18th.

Question 1. [10 points] Create a UML class diagram using Violet UML showing the following relationships:

- Square is a Shape
- Triangle is a Shape
- Circle is a Shape
- CompositeShape is a Shape
- CompositeShape has zero or more Shapes
- ShapeFactory creates Shape (note: this is a "uses" relationship)

Note that you do not need to indicate any methods.

Question 2. [10 points] Briefly describe the features of HTML and CSS which allow separation of content and presentation.

Question 3. [20 points] Briefly describe how an HTTP request is handled in an MVC2 web application, i.e., describe the steps that are typically performed in, for example, a `doPost` method in a Java servlet. Work through the steps from the user's interaction with the Web page that issues the Post, through the HTML generated by the JSP.

Questions 4–7 refer to the following relations:

The **books** relation:

book_id	title	ISBN
1	The Hitchhiker's Guide to the Galaxy	42-424242-42-1
2	A Brief History of Time	01-08-1942-1
3	The Grand Design	01-08-1942-2
4	Life, The Universe, and Everything	42-424242-42-2
5	Tales too Ticklish to Tell	long-live-opus
6	The Days are Just Packed	calvin&hobbes

The **authors** relation:

author_id	lastname	firstname
1	Hawking	Stephen
2	Breathed	Berkey
3	Watterson	Sam
4	Mlodinow	Leonard
5	Adams	Douglas

The **books_authors** relation:

book_id	author_id
1	5
2	1
3	4
3	1
4	5
5	2
6	3

Question 4. [5 points] What tuple(s) are returned by the following query?

select title from books where book_id >= 2 and book_id <= 4

Question 5. [5 points] What tuple(s) are returned by the following query?

select books.title, authors.lastname from books, authors, books_authors
where books.title = 'The Grand Design' and
    books.book_id = books_authors.book_id and
    authors.author_id = books_authors.author_id

Question 6. [10 points] What tuple(s) are returned by the following query?

    select books.title from books, authors
    where authors.lastname = 'Breathed'

Question 7. [10 points] Write a query that finds the ISBNs for all books that have Douglas Adams as an author. NOTE: Your query must use the author's first and last names.

Question 8. [10 points] Briefly describe the purpose of defining an interface (e.g., `IDatabase`) describing the persistence operations supported by an application's persistence layer.

Question 9. [10 points] Briefly state some reasons why bugs are easier and less expensive to fix when they are found early in the development process. Also discuss some of the impacts bugs can have if they make it to the customer.

Question 10. [10 points] Briefly explain the purpose of code coverage testing with respect to developing unit tests, i.e., what situations/conditions do you need to identify in order to adequately test the code?