CS 320, Spring 2020 — April 6th — Mid-Term Exam     Name: _____

This is a take-at-home exam. Download the answer sheet (it's a text file, so you may have to copy and paste the text from your browser into a new text editor file), fill in your name and section, type your answers directly into your file. Submit both your completed answer sheet (as a text file named username-exam-answers.txt, where username is your YCP username) and your UML diagram to Marmoset by no later than 8:00 am, Tuesday, 4-7-20. You will not receive any credit for submissions after that deadline. If, for some reason, you cannot submit to Marmoset, you may then email your answer sheet and UML diagram to me (before the deadline).

- Note: This exam has 120 points and was originally designed to be taken in-class, in 50 minutes. It will be graded on a 120 point scale and there will be NO curve applied.
- You are allowed to use your notes, your lab and assignment solutions, the assigned textbook, the CS320 course website, and the resources explicitly linked from the course Resources web page. Do NOT use any other resources. Since you have 24-hours to finish the exam, I expect you to research your answers, as I am only willing to answer questions that address possible ambiguities in the exam questions.
- You are NOT allowed to discuss any of the material (in any form) with ANYONE else until after the deadline for submission has passed.
- You must express your answers in your own words.

**Question 1**. [10 points]  Give the textual analysis for the following use case:

- The user selects a test from the Test Inventory.
- The instrument returns the list of drugs for the selected test.
- The user selects a specific drug from the drug list.
- The instrument presents the results for the selected drug: the MIC, the SIR, the BDXpert Rule(s), and the Resistance Marker(s).
- The user changes the organism ID.
- The instrument reruns the drug algorithms and BDXpert system for the new organism ID.
- The instrument presents the updated drug results and BDXpert rules based on the new organism ID.

**Question 2**. [10 points]  Briefly discuss the following topics for HTML and CSS:

- What features of HTML and CSS allow separation of content and presentation?

- Why place CSS and HTML in separate files?

**Question 3**. [15 points]  Create a UML class diagram showing the following relationships:

- Car is a Vehicle that has 4 wheels, 1 or more seats, and 2 to 4 doors
- Tesla is a Car that has 1 or 2 electric motors
- ModelS is a Tesla
- ModelX is a Tesla
- Model3 is a Tesla
- TeslaFleet is a collection of 0 of more Teslas of varying types
- TeslaFactory creates all types of Teslas (note: this is a "uses" relationship)

Note that you do not need to indicate any attributes or methods.

**Question 4**. [20 points]  List the various steps that occur when an HTTP request is handled in an MVC2 web application, i.e., the steps that are typically performed in, for example, a `doPost` method in a Java servlet, whose persistance layer is a SQL database. Show the steps starting with the user's submission of the Web page that issues the Post, through the resulting HTML generated by the JSP that is returned to the browser in response to the user submitting the post. Hint: You might not need to use all 13 steps - but a complete answer will be close to that.

1)

2)

3)

4)

5)

6)

7)

8)

9)

10)

11)

12)

13)

Questions 5–8 refer to the following relations:

The **books** relation:

| book_id | title | ISBN | published |
|---------|-------|------|-----------|
| 1 | The Hitchhiker's Guide to the Galaxy | 8-345-39180-3 | 1979 |
| 2 | A Brief History of Time | 8-553-05340-X | 1988 |
| 3 | The Universe in a Nutshell | 8-553-80902-3 | 2001 |
| 4 | Life, The Universe, and Everything | 8-345-39182-9 | 1982 |
| 5 | Blink! | 1-234-56789-0 | 2010 |
| 6 | Tipping Point | 2-345-67890-1 | 2012 |

The **authors** relation:

| author_id | lastname | firstname |
|-----------|----------|-----------|
| 1 | Hawking | Stephen |
| 2 | Gladwell | Malcolm |
| 3 | Adams | Scott |
| 4 | Mlodinow | Leonard |
| 5 | Adams | Douglas |

The **bookAuthors** relation:

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

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

select title, isbn from books where title like 'Universe'

**Question 6**. [5 points] What tuple(s) are returned by the following query?

select books.title, authors.lastname, books.published from bookAuthors, books, authors
where books.title = 'The Universe in a Nutshell' and
    books.book_id = bookAuthors.book_id and
    authors.author_id = bookAuthors.author_id

**Question 7**. [10 points] What tuple(s) are returned by the following query?

select authors.lastname from books, authors
where books.title = 'Tipping Point'

**Question 8**. [10 points] Write a query that returns the title of each of Douglas Adams' books, and the year each was published, in descending order by year.

**Question 9**. [5 points]  What is to be gained by defining an interface (e.g., `IDatabase`) that contains all of the persistence operations supported by an application's persistence layer?

**Question 10**. [5 points]  Give an example of the Liskov Substitution Principle (LSP). Note: You may not use any of the examples given in the text, lecture notes, or the lecture that was given on LSP.

**Question 11**. [5 points]  Give an example of a violation of the Open/Closed Principle (OCP). Note: You may not use any of the examples given in the text, lecture notes, or the lecture that was given on OCP.

**Question 12**. [10 points]  Briefly explain how you determine when it is OK to issue a software release, i.e., when are you "done" testing?  A complete answer will include the reasoning behind releasing software that likely still contains bugs, as well as the steps used to gain confidence in the released software.

**Question 13**. [10 points]  Briefly explain the differences between the Waterfall SW development process and the Agile SW development process. Provide at least 3 `significant` differences between those processes.

1)

2)

3)