1.264 MIDTERM EXAM

FALL 2012

NAME ____

Exam guidelines:

1) 80 minutes are allowed to complete the exam.
2) Open notes; open book.
3) There are 8 questions (100 points) and 9 pages (including this one) in the exam booklet.
4) No laptop computers, calculators, cell phones or messaging devices are allowed. Please turn off any that you have brought.
5) Please write legibly – you are welcome to use both sides of the paper; we can provide additional paper if necessary.

PART I: SOFTWARE PROCESS (35 POINTS; SUGGESTED TIME: 25 MINUTES)

1. **Read the case study below and identify five errors in the execution of the project: circle a phrase from the case to support each error you identify, write a number next to each circled phrase, and describe each error with a phrase or two next to the corresponding numbers on the following page. If the error is an activity that the team did not do and thus is not mentioned, also include it. (15 points) (Suggested time: 15 minutes)**

One Parking is about to launch the first version of a parking garage/lot automation project, Reserve-Your-Spot. The parking garage currently operates without any computerized system. The management has concerns about inefficiencies of sub-optimal usage of parking space. In addition, congestion inside the garage is often caused by drivers searching for vacant spots. Currently, management monitors the garage occupancy by having employees walk around the decks to inspect the occupancy of individual spots. The purpose of Reserve-Your-Spot is to track and manage occupancy of a parking garage and allow customers to find and reserve available parking places. Paul was assigned as the project manager and hired two software developers with more than 5 years of experience. All team members are in the top 25% in talent and experience, and have good tools and familiarity with the area. There is some turnover. Paul's team had been working on the system for a little more than 6 months and now the deadline was just 1 month away. He called the team meeting to order. "According to the schedule, everybody should be checking in the final versions of their code this week. How's that going?"

"Pretty good, but not good enough," Ryan responded honestly. "I've run into a few problems, and I'm working as hard as I can, but I don't see any way I can finish in less than 6 weeks." "That goes double for me," Lorena said. "I'm making good progress, but this never should have been scheduled as a 7-month project. It's more like a 10-month project. I've got 6 or 7 weeks of work left".

"All right. I'm to think about how to break this news to my boss. Give me the rest of the day to come up with a recovery plan, and I'll let you know the plan."

The next day, Paul laid out his plan. He had talked his boss, Michael, into slipping their schedule 4 weeks. He was going to borrow Alison, an analyst from another group to help Lorena and Ryan. And he had a line on a top-notch contractor named Rashmi to pick-up the rest of the slack. Furthermore, Paul divided the project for the team to hardly notice the two new developers and decided to train the new members himself.

"They might be able to help a little," Ryan chimed in. "But I honestly need 6 weeks, and I don't see any way to divide up my work so that I can give any of it to anyone else".

"Are you signed up for this project or not?" Carl said. "The project isn't in that much trouble. Just do your best, and let's see what happens. OK?" Lorena and Ryan didn't see any point in arguing about it, so they said OK and went back to work. They worked almost nonstop for the next 4 weeks, but at the end of that time they were barely any closer to the finish line. "How are we doing?" Paul asked.

“About the same,” Lorena reported. “I’ve still got at least 4 or 5 weeks’ worth of work left”.

“Same here,” Ryan reported.

“What have you guys been doing?” Paul fumed. “Lorena you said you had 6 or 7 weeks of work left, and that was 4 weeks ago. How can you still have 4 or 5 weeks left?”

“Some things took longer than expected, plus, no offense to Alison and Rashmi, but getting them up to speed is taking a lot of time. They didn’t understand how we handle our files,” she said.

Lorena’s patience was wearing thin. She was tired and had poured everything she had into this project. “Listen, we’ve been going all-out for more than 2 months. We’re doing our best. We’ve just had a couple of minor setbacks. Look, I said I’ll be done in 4 or 5 weeks, and that’s when I’ll be done.” The meeting broke up, and Paul optimistically told Michael that the team would be done in 4 weeks.

Four weeks later, the team reported making good progress but still thought it would be another 3 weeks or so until they were done. A few weeks after that, Lorena and Ryan discovered some design flaws that they couldn’t code around, and they had to redesign major chunk of the system. Each bug fix seemed to give rise to two more defect reports and the group’s estimated completion times started getting farther away instead of closer. Paul admitted that he didn’t really know when the project would be finished.

Two months later, after three more 3-week schedule slips, Michael canceled the project.

Write a phrase or two describing each error, making sure that the numbers below correspond to the numbers that you wrote next to the circled text above:

ERROR 1:

ERROR 2:

ERROR 3:

ERROR 4:

ERROR 5:

2. **Answer the following questions based on the system mentioned above. (20 points)(Suggested time: 15 minutes)**

   After firing Paul, One-Parking has hired you, an expert in rapid development practices, as their new Project Manager and has asked you to re-evaluate Reserve-Your-Spot.

   Assume the system has been completely re-designed and that the team has agreed on the mission of the project. Also assume that there are 15 web pages, 6 reports and documents, 12 database tables, 9 inquiries and no external files and the complexity of each is 1/3 low, 1/3 medium, and 1/3 high with and influence multiplier of 1.1.

   a. **How many function points would it contain? (5 pts.)**

   b. **Estimate the lines of code for the system. Assume you will use Perl for the Web application and Oracle for databases, each using 40 lines of code per function point. (3 pts.)**

   c. **What type of product is Reserve-Your-Spot: system, business, or shrink-wrap? Explain. (3 points)**

d. **What type of schedule will you use: fastest possible, efficient or nominal? Explain. (3 points)**

e. **Compute the size of the team based on appropriate tables from *Rapid Development*. (3 points)**

f. **Assign a confidence range to your estimate, and explain why in 1 sentence or phrase. (3 points)**

PART II: DATA MODEL AND UML (35 POINTS; SUGGESTED TIME: 30 MINUTES)

You are asked by a construction company to develop a Project Scheduling System using the following business rules:

- A project has an id, a name, a city, and a state.
- An activity has an id, a name, a starting date and ending date. An activity may be design, construction, quality assurance, etc.
- Each activity belongs to a single project, but a project may have one or more activities.
- A worker has an id and a name. Workers may be assigned to several projects and they have a specific role in each project, but the role may be different on each project. (Roles are different than activities.)
- Several workers may be working on the same project.
- There is a list of possible roles a worker may have in a project. (A worker's role must be on this list.) The possible roles a worker may have are construction worker, manager, supervisor, or office management.

3. **Draw a normalized data model that corresponds to the set of business rules presented below. Follow these steps. You only need to turn in one drawing that includes all the elements listed in steps a-e. (31 points) (Suggested time: 25 minutes)**
    a. **Draw a single box for each entity: give each an appropriate name. (7 points)**
    b. **List the attributes in the box for each entity. (6 points)**
    c. **Indicate the primary key for each entity by placing the phrase (PK) next to its name. (4 points)**
    d. **Draw all relationships between the entities in the model. Indicate foreign keys by placing the phrase (FK) next to attributes that are foreign keys. Show the associative/intermediate table explicitly in many-to-many relationships; don't use the many-to-many notation. You do not have to distinguish between one-to-one-or-many and one-to-zero-or-many in your relationships. (8 points)**
    e. **Indicate the cardinality of the relationship: many-many, many-one or one-one. Use crows-foot notation; if you use another notation, define it. You do not have to indicate the data type. (6 points)**

(**DRAW YOUR DATA MODEL HERE)**

4. What type of UML diagram would you use to represent the following aspects of the new system? In one phrase, explain why. (4 points) (Suggested time: 5 minutes)

a. The activities that make up the system and the connections between them: (1 point)

b. The status of an activity: in process, completed, delayed, etc. (1 point)

c. The people/roles, physical equipment, and constructed elements in the project (1 point)

d. The various ways in which a worker, a project, and a schedule interact: (1 point)

PART III: DATABASE AND SQL (30 POINTS; SUGGESTED TIME: 25 MINUTES)

Suppose that you have implemented the database described in Part II: the tables, attributes, and relationships in the database correspond exactly to the model that you have defined. You are now asked to write the following SQL queries against your database. Briefly define any variable you use that isn't obvious. Assume that the dates are integers; the earliest date is day 1, and the latest date is some higher integer (e.g., day 120). You don't need to use SQL date arithmetic or date functions; just use standard addition or subtraction.

5. **Determine the duration of a project with the name 'Gilman Bridge Replacement'. The duration of the project is determined by the duration of its activities. (8 points)**

6. **List the name of the supervisor of the Gilman Bridge Replacement project. Assume there is only one supervisor. Recall that 'supervisor' is a worker type. (8 points)**

7. **Determine the total number of projects an employee has supervised. (8 points)**

8. **Number of projects in each state. Each state should not be listed more than once (6 points)**