Two hours

Question ONE is COMPULSORY

UNIVERSITY OF MANCHESTER
SCHOOL OF COMPUTER SCIENCE

Agile Software Engineering

Date: Friday 23rd January 2015
Time: 14:00 - 16:00

Please answer Question ONE in Section A and TWO Questions from Section B.

This is a CLOSED book examination

The use of electronic calculators is NOT permitted
Section A

The (single) question in this section is compulsory. It is worth a total of 10 marks.

1. For each of the 5 agile principles given below, describe how it would be violated by the working practices of a team using “big up front” approaches to planning, requirements gathering and design.

   a) “Our highest priority is to satisfy the customer through early and continuous delivery of valuable software.”

   b) “We welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage.”

   c) “The most efficient and effective method of conveying information to and within a development team is face-to-face conversation.”

   d) “Simplicity—the art of maximizing the amount of work not done—is essential.”

   e) “At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behaviour accordingly.”

   (10 marks)
Section B

You should answer any TWO questions from the FOUR questions provided in this section. The questions in this section are all worth 20 marks.

2. a) You have undertaken an internship with an agile development team that, as part of its remit, offers coaching services to other teams in the organisation. Your first task is to create a “Name that Practice” quiz for use during coaching. Each question in the quiz should describe an action taken by team members, and asks the participants to identify the agile practice that is being applied. For example, one question might ask: “What practice is being carried out when a developer puts a card with a number on it face down on a table?” The answer would be “Planning Poker”.

Write 4 more questions in the same style as this one, covering 4 different agile practices. (That is, each question should have a different agile practice as its answer.) Give both the question and the correct answer. Marks will not be awarded for questions that name the intended practice in the action. (8 marks)

b) For the next month or so, you spend some of your time shadowing your boss as she works with other teams in the organisation. During this time, you spend time with two teams experiencing the following problems:

i) Team A is using short iterations and is giving regular showcase demos, which are open to any member of the customer organisation to attend. At first, members of staff from the department that will actually use the software attended regularly, seemed interested in the results, asked many questions and provided many suggestions. But, since the first release of the software, none of the eventual end users are coming to the showcases, and it has started to be difficult to get information from them when needed mid-iteration.

ii) Team B is using a task board to manage its development using short iterations. After two releases, the team is proud of always delivering on time to the client, and the team leader has been known to brag about their accuracy in estimating. “Time-boxing?” he likes to say. “That’s for amateurs.”

Unfortunately, the client is not so pleased, complaining that the delivered software is buggy and unreliable. To get to the root of this problem, you investigate the record of photos of the task board, taken by the team every day to meet its client’s documentation requirements. You are surprised to find that, for this team, story cards only move forward along the task board. You can’t find any instance of a card being moved backwards.

As a training exercise, your boss asks you to diagnose what is going wrong in these teams, assuming that the problem lies within the team and its actions. For each team, suggest what the team might be doing wrong. Justify your diagnosis, and suggest a change that the team could make to their working practices that should address the problem if your diagnosis is correct. (6 marks)

(Question 2 continues on the following page)
(Question 2 continues from the previous page)

c) After some months, your boss judges you ready to work with a team by yourself. Team C is building a replacement software system for anyCar, a regional car hire company. anyCar is concerned that it is losing business to the big chains moving into the area, where customers can get more choice. You join the team just as it is about to organise the stories it has created in its first story-writing workshop into releases. Here are the candidates for the first release:

A. As a frequent customer, I want to reserve a car online, so that I don’t have to waste time waiting for my call to be answered.
B. As a marketing manager, I want customers to have to register before getting access to online services such as car reservations, so that more people will provide their contact details for our marketing lists.
C. As a picky customer, I want to see dates, time and branches when my preferred model of car is available, so that I can get the type of car I want more often.
D. As a branch car park attendant, I want to log departing or returning car by taking a photo of its registration number, so that I can get the data entered more quickly and accurately.
E. As a branch car park attendant, I want to log the arrival of a newly purchased car by taking a photo of its registration number, so that I can get the data entered more quickly and accurately.
F. As a purchasing manager, I want to enter the details of newly purchased cars as I order them, so that the time between their arrival and their being ready for use is minimised.

The team plans a first release containing stories D, E and F. State whether you agree with their decision or not? If you agree, explain the detailed justification for choosing this set of stories for the first release. If you disagree, say which stories you would include in the first release, and why this would be better than the release designed by the team. You may suggest additional stories if you feel the team has missed something important.  

(6 marks)
3. You are a member of an agile team building software to help a new home delivery business to grow. The company currently uses Excel spreadsheets and paper forms to manage its business, but errors are leading to missed deliveries and customer complaints. The company hopes the new system will address these problems.

   a) As a first step to gathering the user stories needed for this application, suggest 4 contrasting user roles that might expect to receive business value from the system to be developed. Provide a short (one sentence) description for each suggestion.

   (4 marks)

   b) For any 3 of the roles you suggested in your answer to part a), describe one behaviour change in that role that the client might wish to see happening due to the deployment and use of the new system.

   (3 marks)

   c) Your team reports that they are struggling with some aspects of story writing, and in particular in identifying thin end-to-end slices. They ask for your help in identifying stories that represent real value but which are also very small, and so can be delivered to the customer very quickly.

   Using the Connextra template that we covered in lectures, suggest 3 contrasting user stories that could be developed within a single 1-week iteration by a team of 6 people and that would deliver real value to the client. Each of your stories should lead (directly or indirectly) to one of the behaviour changes you specified in your answer to part b).

   (9 marks)

   d) Having created an initial backlog of stories, the team starts to estimate them using Planning Poker. Choose one of your stories from your answer to part c). Suppose for this story one team member gives an estimate of 2 story points while the other gives an estimate of 10. Give the justification that each of these team members might give for their estimate in the conversation that follows turning over of the cards. That is, give a justification for the low story point estimate and the high story point estimate. State any assumptions you make about the client’s current systems and availability of data.

   (4 marks)
4. Your company wants to introduce online programming proficiency tests to help screen out unsuitable applicants at an early stage. You are part of an agile team that is working to create the software that will run these tests and process the results.

a) This is a new venture for your company, and many of the staff in the human resources department are worried about their ability to manage the system, given that they know nothing about programming or programming proficiency.

Your team will need the support and time of these people if the project is to be a success. What concrete actions could you take early in the project (before any software is ready to release) to give the HR staff confidence in their ability to use the system and interpret the results? (4 marks)

b) Design an acceptance test table for the following story, and populate it with 8 rows describing 8 contrasting acceptance test cases:

As a recruitment manager, I want applications to be classified according to the results of the programming proficiency test, so that we can respond to applicants more quickly.

On the back of the index card bearing this story, the following conditions of satisfaction have been written:

- Each application is assigned a unique AppID.
- Applications should be classified as “Will interview”, “May interview”, “Won’t interview”.
- Candidate solutions are run against a pre-defined test suite.
- If more than 5% of the tests fail, then classify as “Won’t interview”.
- If the total execution time of the test suite is greater than 150% of the baseline execution time, then classify as “Won’t interview”.
- If no more than 1% of the tests fail, and the total execution time is no greater than 110% of the baseline execution time, then classify as “Interview”.
- Otherwise, class as “May interview”.

Take care to indicate clearly in your answer which of your columns are inputs and which are outputs. (8 marks)
(Question 4 continues from the previous page)

d) Write a SLiM FitNesse fixture for the acceptance test table you designed in your answer to question 4c), using programming-by-wishful-thinking to design the domain objects you think the service level API should implement, in order to provide the functionality described by the user story.

State clearly the table type you are assuming, if it is not already obvious from the test table design (e.g. decision table, query table).

Give a brief description of the domain objects that you invent for your fixture code. Explain the behaviour of any fakes that you create, and state why a fake was needed.

Note: you will not be penalised for simple syntax errors in your solution, or for minor and insignificant deviations from the methods and fields that SLiM expects of fixture classes for your chosen table type. (8 marks)

5. a) In agile testing, it is useful to distinguish between unit tests and integration tests, GUI tests and service level API tests. The different types of test are often written on a pyramid diagram like this one (based on a diagram by Mike Cohn):

Copy this pyramid into your exam script, making it large enough to fill half a page. Then add the four kinds of test into the correct level of the pyramid. Note that this diagram will be a little different from the one we looked at in lectures. One of the types of testing was not in that version of the pyramid. You’ll need to use your understanding of testing basics to work out where to put it in the figure. For each type of test, justify its position in the pyramid relative to its neighbours. (8 marks)

(Question 5 continues on the following page)
b) You have been given the task of coding up a conversion routine between two sets of units that are important in the software your team is building: from quacks to gobbles. You decide to use TDD to write the code. Your starting point is the following conversion table, which shows the upper and lower bounds of the values you will be asked to convert, plus some examples of conversions of representative values. For example, the table indicates that 0 quacks are equal to 12 gobbles. You should use Java and JUnit, and assume that both quacks and gobbles can be adequately represented using doubles.

<table>
<thead>
<tr>
<th>Quacks</th>
<th>Gobbles</th>
</tr>
</thead>
<tbody>
<tr>
<td>-8.0</td>
<td>0</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>-1.0</td>
<td>10.5</td>
</tr>
<tr>
<td>0</td>
<td>12.0</td>
</tr>
<tr>
<td>1.0</td>
<td>13.5</td>
</tr>
<tr>
<td>2.0</td>
<td>15.0</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>8.0</td>
<td>24.0</td>
</tr>
</tbody>
</table>

i) Write the code for the first step of the first red-green-green cycle. If you are going to write test code for this first step, then justify your choice of test values. If you are going to write production code, then justify your choice of first class/method. In either case, justify any design choices you make. (4 marks)

ii) Next show the code for the second step in this first red-green-green cycle. Again, justify any choices you have to make. (2 marks)

iii) Finally, show the code after the final step in this first red-green-green cycle, once again justifying any choices you make. (2 marks)

c) Show the code fragments that you would write or modify for the next two red-green-green cycles that you would undertake in creating this conversion program. Give a brief explanation of your choices at each stage in the coding. (4 marks)