Two hours

Question ONE is COMPULSORY

UNIVERSITY OF MANCHESTER
SCHOOL OF COMPUTER SCIENCE

Agile Software Engineering

Date: Friday 17th January 2014
Time: 09:45 - 11:45

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, name one agile practice that demonstrates some aspect of the principle in action and give a brief justification for your selection of that practice.

   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) “Continuous attention to technical excellence and good design enhances agility.”

   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 are the member of an 8 person in-house software development team for a major UK bank. Your manager insists on using big up front approaches to planning, requirements gathering and design, with everything documented fully using Word document templates that he has designed himself.

Your team is being considered for the following new projects. For each project, state whether you feel confident that the team will be able to deliver genuinely valuable software by the deadline, given your manager’s preferred working practices. Justify your answer in each case, and state whether you think the biggest risk is to meeting the deadline or to the delivery of real value.

i) Every autumn, the bank runs a marketing campaign to persuade new students to open accounts in its university branches. Although the campaign is run along similar lines each year, some small changes are usually made, for example to the campaign graphics and to some of the details of the special products that are offered. The goal of project A is to refresh the relevant parts of the bank’s website and to update the marketing tools used by university branches, so that both are compatible with the new campaign. Campaign details are finalised in May, and the website must go live early in September.

(ii) The bank has just acquired YesMoney, a small regional chain of financial advisors. The bank wishes to retain YesMoney’s existing customers, and so needs to find a way to support YesMoney’s main processes and products using the bank’s own computer systems. The goal of project B is to write new versions of YesMoney’s Java/Python-based software systems that can operate on top of the bank’s .NET databases and transaction management infrastructure. The key systems must be ready for the official merger, in 6 months time.

(iii) In the light of recent changes to UK banking regulations, it has become clear to senior management that some aspects of the banks own regulatory processes are no longer “fit for purpose”. A whole new approach is needed to auditing the financial decisions taken within the bank, requiring a radical change to the way those decisions are reported by staff and recorded by the bank’s systems. Project C is part of a 5 year strategy by the bank to modernise its regulatory processes in annual stages, with a key part of the software infrastructure to be delivered at the end of each stage.

(Question 2 continues on the following page)
b) Before you can start work on any of the projects described in question 2a), you are transferred to a different team within the bank. Your new manager encourages the use of agile practices wherever appropriate.

You join the team just in time to participate in the first story writing workshop for their new project: building software to support the Human Resources department in processing applications for the bank’s graduate recruitment scheme. The current system handles the basic workflow from application submission, through assessment and interviews, to final offer or rejection. But, in recent years, senior management has become concerned that the quality of applicants accepted onto the scheme has been lower than they would like, compared with competitor institutions. The new system must address this.

To prepare for the workshop, come up with 4 contrasting and specific roles that might plausibly receive value from the system the team must create. (2 marks)

c) To further prepare for the story writing workshop, suggest 2 contrasting ways in which the new software system could deliver business value to any of the roles you identified in your answer to question 2b). In each case, clearly identify which of the following forms of business value (from the list by Denne and Cleland-Huang) you would expect the software to deliver:

- Revenue generation
- Cost saving
- Competitive differentiation
- Brand projection
- Enhanced loyalty (6 marks)
3. a) You are an agile coach for a team running its first agile project. You have led the team through a story writing workshop, and the team now needs to set up a story board to manage and monitor progress on the project. The team will use release planning to create releases, and then use an iterative process to tackle subsets of stories in each release. The team is using specification by example, and has decided to automate a full set of acceptance tests for each story before it is released for development. Implemented stories must be passed as “done” by both exploratory testing and automated build and test before they can be showcased.

Design a task board layout for this team. Give the heading you would use for each column and describe what kind of card should go in it. Your description should state clearly what causes a card to be put into the column, and what causes it to leave the column for the next one. (8 marks)

b) 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.

The 6 person team is working on software that will help a local restaurant chain to provide better customer service to diners. The software will run on hand-held devices carried by all front-of-house staff, and should support assigning of diners to tables, managing reservations, taking orders, getting food to the right places quickly, and dealing with general enquiries and requests from diners.

Suggest 3 user stories that could be deployed on the hand-held devices within 2 weeks and that would deliver some real value to the customer independently of the other stories. (6 marks)

c) Suggest an epic user story for the application described in question 3b). (2 marks)

d) A partner team is developing touch screen and voice activated software for use by the kitchen staff in the chain’s restaurants. This presents a problem for your team, when attempting to deliver value early, as any stories which involve passing data between the dining areas and the kitchen will be technically dependent on certain stories being completed by the other team.

What could your team do to get around this problem, and allow them to deliver real value independently of the kitchen software team’s progress? (4 marks)
4. a) Your team uses a BUFR approach and produces lengthy specification documents containing many UML models and pages of accompanying explanatory text. Unfortunately, the team is not so good at maintaining the documents when the requirements change. Your boss is open to considering new ways of working, and she asks you to investigate.

Suggest two reasons why the team might be reluctant or unable to keep their specification documents in step with the customer’s requirements. (2 marks)

b) You decide to look into the possibility of the team changing to use a specification-by-example approach, that will produce “living documentation” for the project. For each of your answers to question 4a), state whether the practice of specification-by-example would resolve the problem you point out or not. Briefly justify your answer. (2 marks)

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

As a flexible contract holder, I want to know how many text messages I can send before the cost per message rises to the next bracket, so that I can better manage the costs of my phone usage.

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

- For flexible contract holders who are up to date with payments, the first 15 txts sent per month are free.
- Flexible contract holders with some payment in arrears get only 5 free txts per month.
- The next 15 txts sent attract a flat rate of 5p per message sent.
- Flexible contract holders who have been on their contract for more than 12 months get a further allowance of 15 txts at a rate of 10p per txt, while everyone else pays 15p per txt for this group of 15 txts.
- After that, the cost per txt rises by 1p for every 15 txts sent.

Take care to indicate clearly in your answer which of your columns are inputs and which are outputs. (8 marks)

(Question 4 continues on the following 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, script 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 each of the following situations, say what the next action of the developer described should be, if the practices of ATDD and TDD are being followed correctly.

i) A developer working on a class C checks code into the source code repository. Later, he receives e-mail from the continuous integration system telling him that his commit caused several unit tests on class D to fail.

ii) A customer member of an agile team adds some new rows to an acceptance test table. She executes the test, and while some of the new rows pass, others are flagged up in red. Worried, she points out the failure to one of the developers.

iii) A developer writes a new unit test for a class he is working on. When he runs the tests, the new unit test fails.

iv) A developer is rushing to get some functionality finished before she leaves for 2 weeks holiday. She writes a failing unit test, but realises she will not have time to make it pass before she has to leave the office.

v) A developer writes a new unit test for a class she is working on. When she runs the tests, the new unit test passes.
vi) A customer adds some new rows to an acceptance test table that the team has been working on for some time. All the new rows turn red when he executes the test, but he notices that some other rows, which previously had been green, are now red. Worried, he points the failures out to a developer. (6 marks)

b) You are pairing with another developer, using TDD to develop a method that finds the longest string in a set of observed strings. The observed strings contain only the letter “A”. You decide to use ping-pong pairing. Your pair partner takes the keyboard first, and writes the following test:

```java
@Test
public void shouldReturnSingleStringFromSingletonObservationSet() {
    ObservationSet observationSet = new ObservationSet("A");
    assertEquals("A", observationSet.longestObserved());
}
```

He then uses his IDE to create the following stub class, to allow him to compile and run the test:

```java
public class ObservationSet {
    public String longestObserved() {
        return null;
    }
}
```

The test fails, and your pair partner hands the keyboard over to you. Describe the next two steps you would take, corresponding to the “green-green” steps of the TDD red-green-green cycle.

(Of course, there are library functions that would help you to implement the required functionality very easily. Assume, for the purposes of this question, that there is no option available other than to code the method from scratch.) (3 marks)

c) Your next task is to write a new failing test: the most simple test you can think of that will fail. There are (at least) three such tests that you could choose to write next. Describe any two of those tests, and write the JUnit code for each of them. (5 marks)

d) You have been awarded a contract to advise a UK software consultancy company on how it can help its teams move towards a more agile approach. In particular, your role is to identify teams within the consultancy that are ready to adopt TDD and those that are not.

Suggest three characteristics you might observe in a team that would suggest it is not yet ready to adopt TDD. For each characteristic, suggest a concrete change you would introduce into the team that is likely to be successful and that would bring them closer to a state of TDD readiness. (6 marks)