B.Sc. EXAMINATION
School of Computing
2 hours

April 2015

Agile Software Engineering (AC31007)

This paper has two parts.

Part 1 (30 minutes) consists of short answer questions to a total of 25 marks.
Part 2 (90 minutes) consists of longer answer questions to a total of 75 marks.

You should answer ALL questions.

This is part 1 of the AC31007 examination. Answer ALL questions.

Part 1 – *Agile planning*

A company is writing software to help a customer manage her shareholding portfolio of several different stock market shares. The set of USER STORIES given below is produced. Review these user stories before answering questions 1-7. You should assume that complexity refers to the number of team days estimated to complete a user story. Note that understanding of shareholdings or stockmarket shares is NOT important.

Most & least: As a shareholder, I want to know my most valuable shareholding and my least valuable shareholding, in whole pounds, for the most recent full week (Mon-Fri) so that I can know which shareholding I should consider increasing or reducing.

Complexity: 7

Business Value: 100

High & low: As a shareholder, I want information about the weekly high and low for each share price so that I can assess the risk of each share investment.

Complexity: 7

Business Value: 150

Rise & fall: As a shareholder, I want to see the rise and fall in value of my shareholding portfolio each day to see my overall shareholding worth in whole pounds.

Complexity: 14

Business Value: 200

Total loss: As a shareholder, I want to know the total loss since opening on Monday of the current week till now so that I can quickly tell if I have made or lost money, and how much.

Complexity: 7

Business Value: 300

Alert: As a shareholder, I want to be alerted if at the end of any trading day the volume of trading has increased by 50% or more compared to the same day in the previous week so that I know how active and how much interest there is in stock for that day.

Complexity: 9

Business Value: 400

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15 minutes: As a shareholder, I want to be alerted 15 minutes prior to the end of the trading day when any of my shareholdings rise by 10% or fall by 20% over the current trading day so that I can react quickly to any large fluctuations in share price.

Complexity: 9

Business Value: 500

Set value: As a shareholder, I want to know how much each shareholding is worth in whole pounds, ordered alphabetically so that I can view the values of my shareholdings at a glance.

Complexity: 5

Business Value: 800

Portfolio value: As a shareholder, I want an estimate of how much my shareholding portfolio is worth in total so that I can tell what my total investment worth is.

Complexity: 5

Business Value: 1000

Question 1.

As written, the user stories are imperfect. What is the problem with the complexity values?

[1 mark]

a. some have the same complexity as others

b. some have the same business value as others

c. all relate to the shareholder and none to the developer

d. some are too large if the team is planning a two-week sprint

Question 2.

What actions should have occurred to reach this point in the planning?

[1 mark]

a. all acceptance tests will have been agreed
b. the team will have allocated specialist roles for each other
c. the product owner and the team will have discussed the user stories
d. the product owner will have agreed what the team's development environment should be

Question 3.

Put the user stories in order of priority, highest priority first, by dragging the user story name to the relevant position.

[4 marks]

i.
ii.
iii.
iv.
v.
vi.
vii.
viii.

Most & least	High & low	Rise & fall	Total loss
15 minutes	Portfolio value	Set value	Alert

Question 4.

What action is needed to resolve the problem with the order of priority?

[1 mark]

a. the sprint length should be increased
b. the team should re-estimate the complexity
c. the product owner should re-estimate the business value
d. everyone should work together to negotiate the best outcome

Question 5.

If the initial sprint is to be two weeks long, which user story or stories should be tackled?

[1 mark]

a. portfolio
b. 15 minutes
c. rise and fall
d. portfolio and worth

Question 6.

If the agreed user story or stories is not likely to be completed by the end of the sprint, what action should the team take?

[1 mark]

a. recruit more team members
b. discuss the issue with the Product Owner
c. agree how much overtime each team member should do to catch up
d. decide which aspects of the work will be postponed until next sprint

Question 7.

If the agreed user story or stories are completed early, i.e. before the end of the sprint, what action should the team take?

[1 mark]

a. discuss the issue with the Product Owner
b. tackle the next user story in the priority order
c. agree to take the extra days as holiday as a reward
d. decide desirable “extras” for the user story or stories to make them even better.

The company produces an initial sprint backlog.

The key for the backlog is given below.

Review the sprint backlog (Figure 1 overleaf) before answering questions 8-13.

Sprint 1 - TASK DESCRIPTION	Description	Who?	Status	Mon	Tue	Wed	Thu	Fri	Mon	Tue	Wed	Thur
1.1 Project preparation												
Research use of Android SDK for displaying share information	12	M		12	8	6	2	0	0	0	0	0
Research use of Google Finance API for task	4	D		4	4	4	3	1	0	0	0	0
Download & Install Eclipse IDE/ANDROID	2	D		2	0	0	0	0	0	0	0	0
1.2 Coding												
Obtain Share Values from API	1	M		1	1	1	1	1	1	0	0	0
Display Total Share Worth	1	C		1	1	1	1	1	1	0	0	0
Design + Implement User Interface	1	D		1	1	1	1	1	1	1	0	0
Coding standards and Team Agreements	1	J		0	0	0	0	0	0	0	0	0
1.3 Testing												
Calculate & Validate Data (testing)	2	J		2	2	2	2	2	2	2	1	0
Sprint 1: Total Hours remaining	24			23	17	15	10	6	5	3	1	0

Figure 1: sprint backlog

Question 8.

The second column is labelled: "Description". Which of the following is the most appropriate alternative name?

[1 mark]

a. time (hours)
b. effort (hours)
c. duration (hours)
d. time remaining (hours)

Question 9.

How many developers are in the team?

[1 mark]

a. three
b. four
c. five
d. six

Question 10.

Which of the following is/are true for this sprint? [NB more than one answer may be correct.]

[3 marks]

a. the team omitted some tasks
b. the team overestimated the tasks
c. the team were working on other projects
d. the team applied the agile approach perfectly
e. all members of the team had the same workload
f. the team worked at an even pace throughout the sprint

Question 11.

The sprint backlog shown is very realistic. Is this statement TRUE or FALSE?

[1 mark]

a. TRUE – the pattern of work is irregular

b. TRUE – all tasks were completed by the end of the sprint

c. FALSE – no tasks were ever added or underestimated

d. FALSE – all tasks were completed by the end of the sprint

Question 12.

The eight items below are mentioned in the Agile Manifesto as four pairs of items in which the first of the pair is the more valued of the two. Drag and drop the eight items to create the four pairs.

[3 marks]

- Comprehensive documentation
- Contract negotiation
- Customer collaboration
- Following a plan
- Individuals and interactions
- Processes and tools
- Responding to change
- Working software

Question 13.

Which of the following scrum artefacts can be used for agile planning purposes? (Tick all that apply.)

[1 mark]

- sprint review
- sprint backlog
- product backlog
- sprint retrospective

Question 14.

Figure 2 overleaf depicts five levels of agile methods planning. Drag word/phrases from the right to match up the missing word/phrases in Figure 2. Note that a word or phrase may be used more than once.

[5 marks]

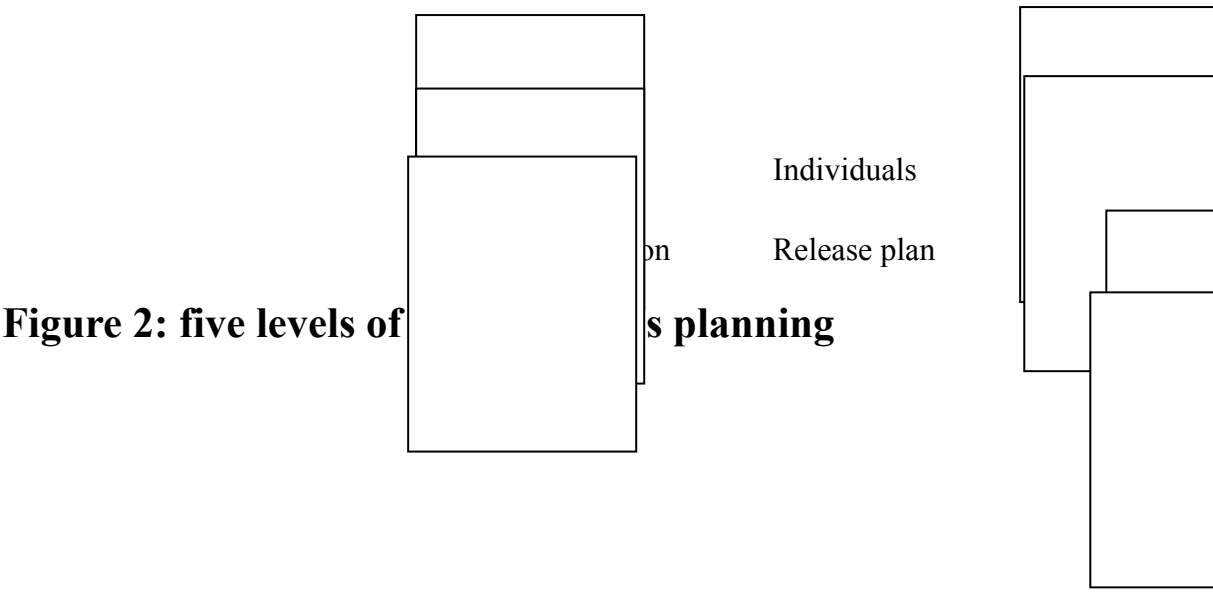

Figure 2: five levels of s planning

Part 2 – *Agile testing, quality and professional issues.*

Question 15.

(a) Nokia wrote the statements shown in Figure 3 below.

i. State what SHOULD happen instead of these in an agile development project.

[3 marks]

ii. Write a similar set of statements for this circumstance: "You know you are **not** doing Test-Driven Development when:"

[3 marks]

> "You know you are **not** doing agile development when:
> - Design and code is produced in individual effort.
> - Progress is measured by hours spent or documents created.
> - Builds are done once in three weeks."

Figure 3

(b) A computer games programmer is developing a game in which a fox attempts to win control of an area of the countryside by defeating the enemy foxes of a neighbouring territory. The super fox, Basil, defeats his enemies by jumping over them to a higher position further up the hillside. The games programmer wants to write code for Basil's jump, which must always be at least 40 pixels in any given direction. Describe how you would use test-driven development to develop code for Basil's jump. You should include pseudocode or actual code to illustrate your answer.

[12 marks]

(c) Would you recommend to a friend to use test-driven development? Justify your answer by outlining TWO advantages and TWO disadvantages of the process. You should refer to published research to evidence your answer.

[7 marks]

Question 16.

(a) Identify the differences between agile and other software engineering methods with respect to quality. You should include in your answer a summary of who is responsible for software quality and when quality-related topics are addressed.

[5 marks]

(b) Outline the steps of a **sprint review** meeting and a **sprint retrospective** meeting, and identify the purposes of each type of meeting.

[8 marks]

(c) A friend has suggested that the code shown in Figure 4 below should be **refactored** so that MethodB can accept an additional parameter.

```
public void MethodA()
{
    MethodB();
}
public void MethodB()
{
    string output = "Test String";
    MessageBox.Show(output);
}
```

Figure 4: Class for testing example

i. Explain what is meant by the term **refactoring**, giving THREE examples of different types of refactoring.

[5 marks]

ii. Identify the benefits that could result from the refactoring suggested by your friend and show how the code in Figure 4 could be rewritten so that MethodB is refactored that way.

[4 marks]

iii. Explain what is meant by "code smells", giving TWO examples.

[3 marks]

Question 17.

(a) Consider the extract from the Hubble Space Telescope Optical Systems Failure Report (NASA, 1990) given in Figure 5 below. Comment on the lessons that can be learned from this for a software engineer in relation to professional behaviour and legal matters.

[15 marks]

> The design of the telescope and the measuring instruments was performed well by skilled optical scientists. However, the fabrication was the responsibility of the Optical Operations Division at the Perkin-Elmer Corporation (P-E), which was insulated from review or technical supervision. The P-E design scientists, management, and Technical Advisory Group, as well as NASA management and NASA review activities, all failed to follow the fabrication process with reasonable diligence and, according to testimony, were unaware that discrepant data existed, although the data were of concern to some members of P-E's Optical Operations Division. Reliance on a single test method was a process which was clearly vulnerable to simple error. Such errors had been seen in other telescope programs, yet no independent tests were planned, although some simple tests to protect against major error were considered and rejected. During the critical time period, there was great concern about cost and schedule, which further inhibited consideration of independent tests.
>
> The most unfortunate aspect of this HST optical system failure, however, is that the data revealing these errors were available from time to time in the fabrication process, but were not recognized and fully investigated at the time. Reviews were inadequate, both internally and externally, and the engineers and scientists who were qualified to analyze the test data did not do so in sufficient detail. Competitive, organizational, cost, and schedule pressures were all factors in limiting full exposure of all the test information to qualified reviewers.

Figure 5

(b) Choose FIVE agile practices and explain what their contribution is to **professional behaviour** in agile teams. You should relate your answer to identified sections of a professional code relevant to software engineering.

[10 marks]

[End of examination paper]