Module Code: XJCO 1911

Module Title: Professional Computing **© UNIVERSITY OF LEEDS**

School of Computing **Semester One 2022/2023**

Calculator instructions:

- You should not need to use a calculator in this exam.

Dictionary instructions:

- You are allowed to use a dictionary in this exam.

Exam information:

- The exam is delivered via MCQ/ Gradescope. The format of the exam may therefore differ from the format of this paper but the content remains the same.
- Time allowed: 2 hours
- Answer all three questions.
- Do not exceed the stated maximum word limits for text based answers.
- Do not upload more than one page for drawing based answers. Hand drawing is recommended but you may use software to draw if you prefer. Be aware that some software tools can introduce syntax and notation errors that you should correct for full marks.
- This is an open book examination. Any written or printed material is permitted. You are unlikely to win credit in any question for reproduction or simple rephrasing of notes. Under no circumstance should you copy and paste material from the Internet, public sources, lecture notes etc.
- During the exam you will be under University of Leeds examination rules which mean that must not have any contact with other students or other people during the exam with the exception that you may contact the module leader via Teams or the student office via email if you have technical issues or challenges.

Question 1 – 34 marks total

These questions will implemented as MCQs with a choice of the correct answer and four similar but incorrect answers with 2 marks for each question. Answers will be randomised in the MCQ software.

1.1 Which of the following best describes the sequence of interactions involved when a customer uses a payment card such as a credit or debit card to buy some perfume in a city centre shop which uses an Electronic Point of Sale (EPOS) till. **[2 marks]**

- (Correct) 1: The product code is scanned and the amount to pay is displayed. 2: The payment card details are checked and validated. 3: Card and transaction details are sent to the payment card provider who debits the amount to the customer's account and credits this to the shop. 4: The EPOS till updates the stock management system to show that the perfume has been sold.
- 1: The perfume has a bar code which is scanned by the EPOS till. 2: The amount to pay is displayed and the payment card details are entered and validated. 3: The stock of perfumes is updated at exactly the same time as the sale is completed. 4: The amount is subtracted from the customer's account and added to the shop's account.
- 1: The perfume bar code is used to determine the amount to pay. 2: The amount to pay is charged against the person's account after they have input their payment card details. 3: The EPOS system checks whether the perfume is in stock and stops the sale if no stock is available. 4: If the sale is successful the amount is added to the shop's account by the payment card provider system.
- 1: The EPOS till scans the bar code of the perfume and updates the stock management system to show that the perfume has been sold. 2: The amount to pay is displayed and the payment card details are entered and validated. 3: If the payment is invalid then the EPOS system stops the sale. 4: If the sale is successful the amount is transferred from the person's account to the shop by the EPOS system.
- 1: The EPOS till scans the bar code of the perfume. 2: The customer's payment card details are taken. 3: The sale is complete – the stock management system is updated and the customer leaves. 4: The EPOS till sends all payment card transactions to different card providers at the end of each day and receives credit amounts for all those that are valid.

1.2 How has the price of computing hardware affected business innovation? **[2 marks]**

- (Correct) Falling hardware costs has made computing cheaper for everyone and this has stimulated demand and led to competition to build more sophisticated business applications that have enabled business innovation.
- Rising hardware costs have forced businesses to innovate in order to be able to afford the hardware.
- The price of computing hardware has gone up and up. This has led to a reduction on business innovation over time.
- Moore's Law has led to increasing processing power and this helps businesses "think" in more innovative ways as they are learning from the hardware industry.
- Demand for computing hardware has led to competition to reduce prices. Businesses have used the cost savings from hardware to innovate with new products and services.

1.3 Why would an employer find a British Computer Society (BCS) accredited degree more impressive than a degree that was not accredited? **[2 marks]**

- (Correct) Employers want to know that the degree delivers content that meets recognised quality standards.
- The BCS audit degree programmes to make sure that they include enough ethics.
- Graduates are accredited as meeting the Basic Computing Standard that employers require.
- Degrees that are not accredited by the BCS are not fully recognised as BSc Computer Science.
- Many employers will only employ graduates with a BCS accredited degree.

1.4 Which of the following sentences is a true statement about the "Victorian Internet", the telegraph network developed in the 19th Century? **[2 marks]**

- (Correct) The telegraph network expanded very quickly and, like the modern Internet, had a major impact on society and the economy as it created new ways of doing business and working.
- The Victorian Internet connected countries across the world so that they could work together on world peace and protecting the environment.
- The Victorian's stole the idea of "tele-"graph from Napoleon of France and used it to colonise America.
- The Victorian Internet grew faster than the modern Internet, helped catch criminals and enabled long distance marriages which are now banned on the modern Internet.
- The telegraph network developed in Europe and America using two different TCP/IP protocols and the two networks were then connected by under-sea cables to create the first global Internet once the differences between the two protocols were resolve.

1.5 What network was used to get the data from the J. Lyons' Tea Shops into the J. Lyon's LEO computer every day? **[2 marks]**

- (Correct) Telephone network. The tea shop rang every day to tell the LEO staff what they needed.
- Social network. The tea shops were very social places and the data spread through social networks.
- Telegraph. Tea shop operators used Morse Code to encrypt the data for transmission through the telegraph system that was widely use in the UK at that time.
- The Internet. They used a very simple data entry form to input data that was then checked by staff at Head Office before being uploaded to LEO.
- The Arpanet. The LEO computer was introduced in the 1960s and this was before the modern Internet was available, so J. Lyons had to use the Arpanet wide-area packet-switched network with distributed control.

1.6 What is the most complex element of a modern computer system? **[2 marks]**

- (Correct) People
- Business Processes
- Hardware

- Software
- Networks

1.7 In a team meeting, a group of people are reviewing the minutes of the previous meeting. Which of the following statements reflects bad practice? **[2 marks]**

- (Correct) Actions that were assigned to a team member who is absent should be discussed at the next meeting so that can update on progress.
- The minutes of the previous meeting should be reviewed before the more general updates on progress.
- If a team member is recorded as absent without apologies there should be an action on someone to contact the missing team member.
- Actions from the last meeting should be reviewed and completed actions should be recorded as complete.
- Actions in the minutes from the last meeting that were not complete should be recorded on the minutes for the current meeting and reviewed again in future meetings until they are complete.

1.8 The Waterfall Model of software development is sometimes drawn as in the shape of a "V", known as the V Model. What useful insight does the V Model convey? **[2 marks]**

- (Correct) The activities in the initial stages of development produce documents that can be used to check the outputs of the later stages.
- Software development is never as simple as a downward waterfall. The V Model shows how the stages "bounce back".
- Business modelling can lead to a used system, but the requirements stage will only ever create an un-used system.
- Both documents and unused software have equal value.
- The V Model allows waterfalls to be repeated by allowing for activities to be done in any order.

1.9 Which of the following lists includes two potential users and two other potential stakeholders of a new smartphone app to control a heating system in a house. **[2 marks]**

- (Correct) Users: homeowner, other people living in the house. Other stakeholders: Energy provider, smartphone app provider.
- Users: residents, energy provider. Other stakeholders: Environmental activists, homeowner.
- Users: homeowner, developers of the app. Other stakeholders: smartphone app provider, smartphone network provider.
- Users: all people living in the house over 18, children under 18. Other stakeholders: the house itself, other people living nearby.
- Users: all people who visit the house including guests, API interface to the heating system. Other stakeholders: energy provider, Planet Earth.

1.10 Which of the following is NOT a duty of a scrum master? **[2 marks]**

- (Correct) Allocating Product Backlog items to the development team.
- Acting as a channel for communication to the customer during a sprint.
- Taking part in daily "stand ups".
- Protecting the development team from distractions.
- coaching the team members in self-management and cross-functionality

1.11 When interviewing a potential user to investigate the requirements for a new system which one of the following is NOT good practice? **[2 marks]**

- (Correct) Being very clear with the interviewee that they must answer all your questions fully.
- Showing the interviewee user interface prototypes to stimulate a discussion about what the new system should do.
- Asking the interviewee for permission to record the interview for note taking.
- Emailing the interviewee with a summary of notes from the interview and asking them to confirm their accuracy.
- Starting with closed questions that require short answers and ending with a wide-open question such as “is there anything else you would like to tell me”?

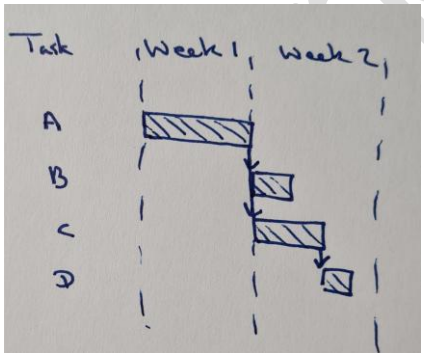
1.12 Which one of the following is regarded as good practice when doing a presentation? **[2 marks]**

- (Correct) Maintaining eye contact with the audience if you are comfortable doing so.
- Using carefully prepared speaker notes that you hold in your hand during your talk.
- Using jokes in your presentation and laughing at them so the audience knows when to laugh.
- Reading everything that is on every slide no matter how long that takes.
- Finishing your presentation by loudly shouting “any questions?”.

1.13 A student uses a Kanban board to organise her revision. Which of the follow should she NOT do? **[2 marks]**

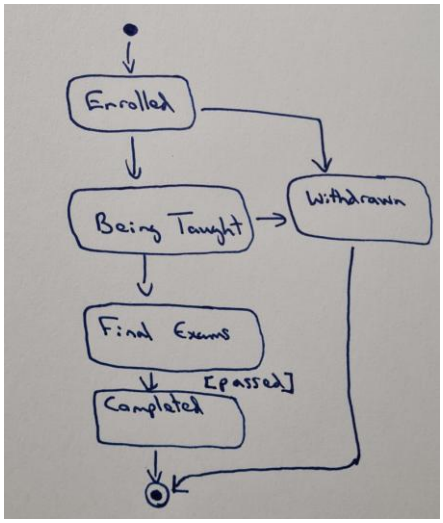
- (Correct) Throw away the completed task cards.
- List all the things to revise on task cards.
- Add all new cards to a backlog or “To Do” list.
- Decide which task to do and move that to the in progress or “Doing” list.
- When a task is complete move the card to the Completed or “Done” list.

1.14 Which one of the following statements about this Gantt chart is true? **[2 marks]**



- (Correct) Task B could start slightly later without affecting the critical path.
- If Task A took longer then Task B could still start on time.
- Task B must be complete before Task C can start.
- There is a Start-to-Finish dependency between Task A and Task D.
- Task D can could be started while Task A is still in progress.

1.15 Which one of the following statements about this UML state diagram for students on a course is NOT true? **[2 marks]**



- (Correct) A student who has withdrawn can enrol again.
- Students cannot withdraw after the final exams.
- It is not clear what happens to a student who fails the final exams.
- Student can withdraw any time while they are being taught.
- The transition between Final Exams and Completed has an associated guard condition.

1.16 What is the difference between Analysis and Design? **[2 marks]**

- (Correct) Analysis tries to understand a problem while Design tries to provide a solution.
- Nothing, they are the same thing.
- Analysis investigates possible solutions and Design builds them.
- There can be many candidate designs and Analysis investigates each one.
- Design cannot start until Analysis is complete.

1.17 Which of the following is NOT a good reason for an organisation to decide to buy a software package rather than build a system. **[2 marks]**

- (Correct) The software package will be maintained free of charge.
- Availability of many good software package solutions.
- Lack of software development skills within the organisation.
- Faster and often cheaper to implement software packages.
- Software packages can support “best practice” business processes.

Question 2 (33 marks)

Guest lecturer questions 2.1 to 2.6 … (12 marks total)

2.1 Reflecting on the guest lecture by Dr Simon Davy, an open-source software developer, which of the following statement about open source is NOT correct? **[2 marks]**

- (Correct) The open-source software community needed to use collaborative tools from commercial software companies, for example Microsoft Teams.
- Open Source forced all communication to be written down.
- All of modern computing is built on open-source software.

- Open Source projects often hold sprints to enable real-world face-to-face collaboration periodically.
- Open Source projects must use version control, such as Git, to collaborate.

2.2 Reflecting on the guest lecture by Lucy Mairs, an experienced project manager, which of the following statement about project management is correct? **[2 marks]**

- (Correct) The most challenging part of Project Management is the actual management of teams, self-governing team approach is your best chance of success.
- SCRUM Masters and Project Managers are the same role.
- The daily activities of a SCRUM Master keep the same.
- The duty of a project manager is just to make sure the project is delivered on time.
- Waterfall model was popular, but is no longer used very much.

2.3 Reflecting on the guest lecture by Richard Fennell, Chief Technology Officer of Black Marble, on Living the Dream - DevOps, how has DevOps transformed computing? **[2 marks]**

- (Correct) Live systems can be reliably updated many times a day.
- Developers and Operations people work together in mixed teams.
- Operations people have automated tools so that they can develop their own software.
- Both Developers and Operations people do much more testing.
- DevOps led to cloud computing platforms like Microsoft Azure so that modern computing takes place on the cloud.

2.4 Reflecting on the second guest lecture by Richard Fennell, Chief Technology Officer of Black Marble, on Test Driven Development (TDD), which one of the following is NOT a good reason for adopting TDD? **[2 marks]**

- (Correct) Large numbers of unit tests are required even for automatically generated code.
- Writing the tests first helps a developer to think carefully about how the code should work.
- Unit tests are needed for regression testing.
- Fully automated DevOps can only be implemented if TDD is adopted.
- TDD simplifies debugging as bugs are spotted quickly when a test fails.

2.5 Reflecting on the guest lecture by BJSS on agile development, which of the following statement is NOT correct? **[2 marks]**

- (Correct) Either a Scrum Master or Project Manager should allocate the work to each team member.
- The team should be self-organising; they should decide for themselves who does what work.
- With an Agile delivery, they agree the smallest subset of those to produce a working system and greatest benefit – the Minimum Viable Product.
- User Stories are routinely revisited for the next few Sprints, to confirm the understanding of them, revisit the estimates, and ensure those are ready to start.
- Agile teams need a clear, and prioritised feed of business goals to drive their delivery work, which is usually provided by a Product Owner.

2.6 Reflecting on the guest lecture by Rich McIntyre from BJSS on a day in the life of a software developer which of the following statements is correct? **[2 marks]**

- (Correct) Deployment to production cannot always be automated as sometimes it is important that humans perform safety checks.
- Google can achieve a deployment frequency of more than 5000 deployments per day because they have many more employees than other organisations.
- Software Engineering is just about developing code.
- It is cheaper to do testing in the live (production) system as the users can help do the debugging.
- There is no creativity in testing, and so Software Testing does not offer opportunities for career growth.

2.7 Which of the following is NOT offered as a justification for surveillance? **[2 marks]**

- (Correct) Surveillance reduces privacy.
- When it is clear that people are being surveilled, this can deter crime and anti-social behaviour.
- Surveillance can assist public health responses to infectious diseases.
- Surveillance enables the collection of useful information.
- Surveillance enables the authorities to discover crimes and the identity of perpetrators of crimes.

2.8 In computer hacking, which of the following best defines stereotype threat? **[2 marks]**

- (Correct) A psychological mechanism that causes people to perform less well at high-stakes tasks when reminded of their membership of certain groups.
- Unconscious attitudes that affect the ways in which a person perceives, evaluates, and interacts with members of certain groups, in line with stereotypes.
- A person's unconscious beliefs about the statistical likelihood of particular events.
- Any sexist and racist belief held by an individual, which causes harm to members of certain groups.
- Computer software that causes discriminatory outcomes.

2.9 Which of the following best describes the Cognitive Condition for moral responsibility? **[2 marks]**

- (Correct) In order to be responsible for something, a person must have the psychological capacity to understand how their actions could cause it to happen.
- In order to be responsible for something, a person must know that their actions will cause it to happen.
- In order to be responsible for something, a person's actions must make a difference to whether it happens or not.
- A person is only responsible for their actions if they choose to act.
- In order to be responsible for something, a person must deliberately try to make it happen.

2.10 Which of the following best reflects the achievement of recognitional justice? **[2 marks]**

- (Correct) Everyone is granted equal respect and is treated as though their interests are of equal worth.
- A person's wrongdoing is recognised, and they are punished appropriately.

- Everyone recognises and understands the responsibilities that they have to complete certain tasks.
- Resources, opportunities, benefits, and burdens are allocated in a just (morally right) way.
- Everyone's contribution to a shared project is recognised and everyone involved is compensated appropriately.

2.11 In 2011, Aaron Schwartz was arrested. While a student at the Massachusetts Institute of Technology (MIT), he connected a computer to the network and set it to periodically download academic papers *en masse* from the academic journal database JSTOR and release these into the public domain, where they could be accessed by anyone. With reference to the discussion hacking in this course, were Schwartz's actions morally justified? **[13 marks – max 130 words]**

Model Answer and Marking Scheme

Students may raise any of the following points.

• *Freedom – Information should be free. The purported 'owners' of this information should not be able to restrict access to and dissemination of this information. This is because restricting information in this way reduces the freedom of people to share and access it as they wish. By acting in the way that he did, Schwartz ensured that far more people are free to access the information contained in the journal articles, which was previously restricted by the publishing companies. In addition, he did nothing wrong by exercising his own freedom to disseminate this information as he saw fit.*

• *Consent – Schwartz accessed the academic journal articles without the consent of the people or organisations who owned them. It is usually wrong to take something from the person who owns it without their permission. Consent is a kind of permission-giving, so Schwartz did not have permission to take these articles from the proper owners.*

• *Property – Property is important because it enables people to benefit from and profit from their work. In the case of the academic journals, if people can access these without subscribing to the journal, then the publisher will earn less money. Schwartz accessed and disseminated these journal articles in a way that infringed on the property rights of their owners. So, Schwartz's actions may be wrong because they violated the property rights of the academic publishers and so prevented them from profiting to the same degree. OR/BUT Schwartz did not damage any of the property of these organisations or remove their access to the academic journals. Unlike the theft of physical property, copying an academic journal does not deprive the owner of anything. So, Schwartz did not violate the publishers' property rights or deprive them of anything. So, his actions were justified.*

• *Privacy – Hacking is often wrong because it involves accessing personal and confidential data about people, which undermines their privacy. Schwartz accessed academic journals, which do not contain any personal data that is not already widely available. So, Schwarz did not undermine anyone's privacy. This counts in favour of thinking that his actions were justified.*

Question 3 (33 marks)

3.1 You have been asked to model the requirements for a local hotel that wants to buy a new computer system. Identify two requirements that you could identify by observing staff using the old system and two requirements that you could identify through customer interviews. **[4 marks – max 40 words]**

Model answer and marking scheme

Observation will identify requirements as per current system (e.g. Book rooms, register customer, check in and check out). Interviews can identify new requirements (e.g. Advance booking, preview rooms, personalized service). 1 mark for any two requirements from observation. 1 mark for any two requirements from interviews.

3.2 Draw a use case diagram showing the staff and customers as actors and the four requirements you have identified in 3.1. **[6 marks – max one page]**

Model Answer and marking scheme

The actors should be customer and staff. The four requirements from 3.1 should be represented by four use cases as per the example below (actual use cases will vary depending on the answer in i) above). 1 mark for the two actors correctly drawn. 2 mark for use cases as ovals, associations and system boundary. Up to 3 marks for representing the four requirements using the verb noun phrase convention.

3.3 You are responsible for taking the minutes of a meeting for a group project. A group member Is missing and cannot be found despite several people telephoning and messaging them. The missing group member was responsible for several very urgent actions. What would you write on the minutes to record the problem and agreed solution? **[5 marks – max 50 words]**

Model answer and marking scheme

Record them as "Absent without apology". Record the status of the Actions as "Unknown" or similar. Record the attempts to contact the missing person. Record the Actions arising to contact the missing person. Record new actions to mitigate or complete the urgent tasks. 1 mark for each of five well-made points.

3.4 A student is about to start her revision for Professional Computing. Define an objective for her revision that meets the SMART criteria (Specific, Measurable, Achievable, Relevant, Timely) and explain how it meets each of these criteria. **[6 marks, max 60 words]**

Model answer and marking scheme

1 mark for stating an objective that meets the criteria and 1 mark for each of the five criteria applied to the scenario.

3.5 Draw a simple mind map (with no more than 9 end nodes) to show your understanding of professionalism in Computer Science. **[12 marks – max one page]**

Model answer and marking scheme

Professionalism in Computer Science could include the ability of effective group work, technical report writing, Professional responsibility in Computing (Ethics), Professional competence (understanding of software development life cycle, choosing appropriate software development models such as Waterfall model, Agile methods, test-driven method, investigation methods, system modelling methods, design and implementation methods, and programming languages), Bound by a code of conduct, Member of a professional body – the selection is a personal one so does not need to be comprehensive.

1 mark for having Professional Computing written in the centre. Up to 3 marks for branches following mind mapping conventions. Up to 8 marks for appropriately named end nodes.