UNIVERSITY OF OTAGO EXAMINATIONS 2018

INFORMATION SCIENCE

INFO 201

Developing Information Systems 1
Semester One

(TIME ALLOWED: 3 HOURS)

This examination paper comprises 8 pages.

Candidates should answer questions as follows:

Section A (short-answer questions): Answer ALL questions (total 40 marks)
Section B (practical questions): Answer ALL questions (total 60 marks)

The following material is provided:

NIL

Use of calculators:

No calculators permitted.

Candidates are permitted copies of:

NIL

Other Instructions:

NIL

TURN OVER

Section A

ANSWER ALL QUESTIONS
Questions in this section (total 40 marks) are short-answer questions.

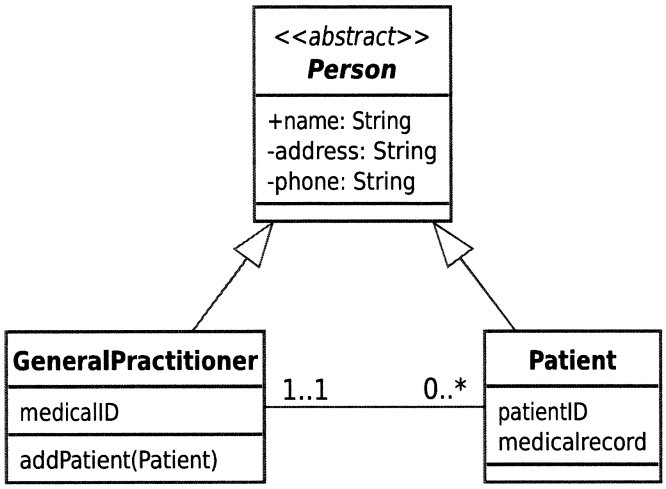
1. Briefly describe the key differences between traditional and agile methodologies. Then briefly describe a situation in which it would be better to use a traditional methodology, highlighting the factors that make an agile methodology a poor choice for this situation. (6 marks)

2. In deciding whether to proceed with a project an organisation might estimate costs and benefits, and calculate net-present value (NPV) and return on investment (ROI). However, there can be situations in which the best decision is to *not* proceed with a project, even though the NPV is positive and the ROI good. Briefly describe *three* factors that each may lead to this situation, where one should not proceed, despite good NPV and ROI. (3 marks)

3. Name *three* properties of good requirements, and for each property briefly explain why it is a good property. (4 marks)

4. Briefly explain what an update anomaly is. Give an example of a database design demonstrating an update anomaly (showing some example data). Briefly explain how *normalisation* can be used to avoid update anomalies (but you do not need to perform normalisation on your example). (6 marks)

5. Map the following UML class diagram to Java code, and indicate any assumptions that you have made. You do *not* need to provide initialisation code, or a `main()` method. You will not lose marks for minor syntactical errors.



(8 marks)

6. Describe a scenario in which you would recommend that a *direct* deployment approach be adopted, and explain what features of the scenario lead to this recommendation.
(5 marks)

7. Briefly explain how single-key (symmetric) encryption works. What are its strengths and what are its weaknesses? (3 marks)

8. Explain what devops is. You need to cover in your explanation the potential advantages of devops, and the challenges involved in adopting devops. (5 marks)

[SECTION A TOTAL 40 MARKS]

Section B

ANSWER ALL QUESTIONS FROM THIS SECTION

Questions in this section (total 60 marks) are practical and require you to perform analysis and design tasks. The questions relate to the scenario described on pages 5 to 8. Allocate approximately 1.8 minutes per mark.

9. Draw a use case diagram showing the scenario described on pages 5 to 8. Ensure that you make appropriate use of «extend» and «include» for instance to capture optional parts of the process. (15 marks)

10. Draw a BPMN diagram showing the process of art work being requested, loaned, and returned. Ensure that you use standard BPMN notation, that you have swimlanes for key entities involved, and that you capture the different possible situations. (20 marks)

11. Draw a *UML* Class Diagram that represents the data requirements of the case study presented on pages 5 to 8. The Class Diagram should follow these conventions:

    - Label the classes with relevant stereotypes (e.g. «`entity`» or «`abstract`»).
    - Contain attributes, an appropriate data type for each attribute, & appropriate visibility for each attribute.
    - Do **NOT** model behaviour i.e. method definitions (e.g. `set` or `get` operations).
    - Associations must include names & multiplicity.
    - Include at least one example of inheritance (generalisation).
    - Include Aggregation & Composition where appropriate.
    - Include role names and navigability where appropriate.

    Describe any assumptions that you consider necessary to complete the design, or to clarify any ambiguity you believe exists. (25 marks)

CASE STUDY: Art-in-a-Minute

1 Background

The **Art-in-a-Minute** loan agency is a small business that loans out art to galleries nationwide. They have a number of galleries listed in their books to whom they loan artworks, as well as various artists who produce the artworks. As business has picked up, the manual system for tracking the inventory of artwork, and the loan of these artworks to galleries, has begun to prove unsatisfactory due to various kinds of problems plaguing the system. These include inaccuracy in transaction related information, poor performance, and loss of information. Consequently, they have asked you to provide conceptual designs for a new computerised solution to replace this manual system. These designs will be based on the components of the requirements specification (see § 1.1, § 1.2, § 1.3 and § 1.4) prepared by a senior analyst hired earlier by the company.

1.1 Interview transcript

Below is the transcript resulting from the interview between senior analyst, *Alan Vertiente* and owner of **Art-in-a-Minute**, *Pam Pluto*.

ANALYST Hi, I have been asked to talk to you about the main business activities of *Art-in-a-Minute*, however, for the purposes of today's interview, I want to focus specifically on the management of loans of artworks to galleries.

CLIENT Sure, where do we start?

ANALYST How about from the first thing *Art-in-a-Minute* does, when a gallery wants to borrow an artwork.

CLIENT Righto, well the gallery requests the artwork or artworks they require ...

ANALYST You mention artworks there, so I take it they can borrow more than one artwork at a time?

CLIENT Yes, that's correct. It doesn't matter whether they borrow one or five artworks, it is still part of the same loan transaction.

ANALYST Oh right, I understand. Next question. What specific information do you keep about each loan transaction?

CLIENT Well, we currently write down information about the loan manually, which is very tedious. However, the things we keep track of are, the date of the loan, the artworks involved in the transaction, the date due for each artwork, and the charge for each artwork rented out. We also leave space for recording the date for when the artwork is eventually returned.

ANALYST Well, that's a lot of information. Can I clarify a few points regarding your description?

CLIENT Sure, go ahead.

ANALYST Okay, why do you need to store the due date for each artwork?

CLIENT Well some artworks are more important so we may give these artworks an earlier due date, as they tend to be more popular. It just gives us that extra flexibility as we can ensure the artworks are in good condition and available for other galleries to borrow. Is this kind of thing possible?

ANALYST It shouldn't be a problem. Your answer though, brings me to my next question. Why would you need to store a separate charge for each artwork involved in a loan transaction? I would have thought that each artwork would have it's own set charge assigned to it.

CLIENT Good point! You are right, each artwork does

have a set charge assigned to it but sometimes we may charge a gallery a lesser amount to loan out a particular artwork to them, especially when they are good borrowers.

ANALYST Oh, I see that makes sense. Would it also be useful to document when a gallery is a good borrower?

CLIENT Yes, that would be very handy.

ANALYST I think I understand the date of return information as well. Different artworks could conceivably come back at different times so you want to be able to keep individual return dates for each artwork involved in a particular loan transaction.

CLIENT That's absolutely right. We also flag whether an artwork is available so that we know instantly if an artwork is currently loaned out.

ANALYST Right, so if a gallery requests an artwork, you can check a list of your artworks or something, and see if it has been flagged as 'not available'.

CLIENT Yes, correct.

ANALYST And I guess you would set the availability of an artwork to 'not available' at the time of the loan transaction. Is this right?

CLIENT Yes, that is also correct.

ANALYST We could probably store some kind of flag against each artwork for just this purpose.

CLIENT Excellent!

ANALYST The next logical direction would be the artworks themselves. What kind of information do you currently keep about them?

CLIENT Well, the title of the piece, the year it was made, the name of the artist, and the type of artwork it is ...

ANALYST Can I stop you there. I'm not sure what you mean exactly by type?

CLIENT Oh, basically it's whether the artwork is a painting, a sculpture, a photograph, etc.

ANALYST Okay, and what about your customers - the galleries, do you keep information about them too?

CLIENT Sure do, we need contact details for them so that we can get in touch with them, especially if they are late returning artworks.

ANALYST That sounds suspiciously like a requirement for a report but I will leave that for now and come back to it in a follow-up interview. For now, what happens when a new gallery makes a request, that is, you don't have any information about them?

CLIENT The first thing we do in these cases is record their contact details such as their address, phone number, fax numbers and email addresses, if they have them. We also get them to identify a principal contact person at the gallery that we can contact when required.

ANALYST Okay, and then what?

CLIENT The next thing we do is get the principal contact person to tell us which pieces of art they wish to borrow, and, for each piece, what period they want to borrow it for. Our staff member then checks each requested item to see if it is available. He or she may need to interact with the principal contact person if an item is not available, or is only available for part of the requested period.

ANALYST And what happens if an item is only available for part of the period?

CLIENT The borrower may accept a shorter period, or may decide to not borrow the piece of artwork. In rare cases they may even decide to cancel the whole request.

ANALYST I see. And assuming the borrowing request does proceed?

CLIENT Then a senior customer liaison officer reviews the request and assigns a price, taking into account the borrower's status. The borrower then can accept or reject the price, and if they accept then we mark the artwork as unavailable, and our shipping department is asked to package up and sent out the artwork.

ANALYST Okay, excellent. Would you be able to explain what currently happens when an artwork is returned?

CLIENT Sure thing. It is a very similar process to a library system. The gallery brings back the artwork, a staff member enters the date of return in our records, and flags the specific artwork as 'available'. If the artwork is returned late, then an additional fee is charged.

ANALYST Right, I see that we will need to keep information about *Art-in-a-Minute* staff as well. I assume the usual information like name and contact details, as well as salary. What other information on staff would be required?

CLIENT Hmm. I guess it would be good to capture for each staff member who their supervisor is, and whether they are able to act as a senior customer liaison officer.

ANALYST Excellent, I think I have more than enough information now. Thank you very much for your time.

CLIENT No, problem.

1.2 Business rules

1. All new galleries requesting artworks must have their name and contact details on record.
2. There must be a separate due date for each artwork involved in a particular loan transaction.
3. When renting out artworks, the availability must be checked first.
4. A loan transaction is always the responsibility of one staff member.

1.3 Glossary

Artwork A piece of art such as painting, sculpture, etc. produced by an artist.

Artist A person who manufactures art.

Gallery A room or series of rooms where works of art are exhibited.

1.4 Form

Figure 1 shows a mock-up form that details a loan transaction between **Art-in-a-Minute** and a gallery.

ART-in-a-Minute Loan Agency
100 Freehold St, Dunedin, New Zealand Ph: 6555492 Fax:655908
ART WORK LOAN RECORD

LOAN NO:		DATE:	
STAFF:			

GALLERY ID:
NAME:
ADDRESS:
SUBURB:
CITY:
PHONE:
FAX:
EMAIL:

ARTWORK CODE	TITLE	TYPE	ARTIST	YEAR	DUE DATE	RETURN DATE	CHARGE
						GST TOTAL	

Figure 1: *A mock-up of an Art-in-a-Minute Loan record*

[SECTION B TOTAL 60 MARKS]

END