

UNIVERSITY OF OTAGO EXAMINATIONS 2019

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 30 marks)

Section B (practical questions): Answer ALL questions (total 70 marks)

The following material is provided:

NIL

Use of calculators:

No calculators permitted.

Candidates are permitted copies of:

NIL

Other Instructions:

Write answers in answer book(s)

TURN OVER

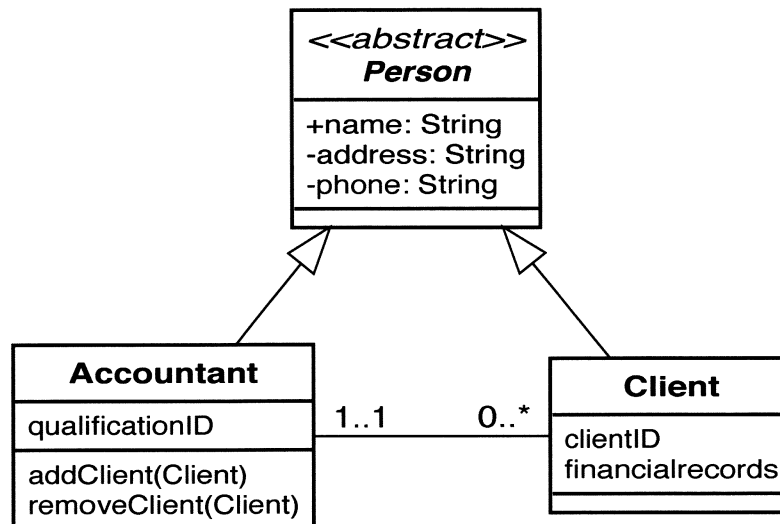
Section A

ANSWER ALL QUESTIONS

Questions in this section (total 30 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. (5 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). Briefly explain how to calculate NPV, and ROI. Give an example table showing how NPV might be calculated for an example scenario. Note that you do *not* need to give actual numbers, just formulae. (3 marks)
3. Name *three* properties of good requirements, and for each property give a simple example requirement that *violates* the property. (4 marks)
4. Briefly explain what an **insert** anomaly is. Give an example of a database design demonstrating an insert anomaly (showing some example data). Briefly explain how *normalisation* can be used to avoid insert anomalies (but you do not need to perform normalisation on your example). (5 marks)
5. Describe a scenario in which you would recommend that a *parallel* deployment approach be adopted, and explain what features of the scenario lead to this recommendation. (5 marks)

6. 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)

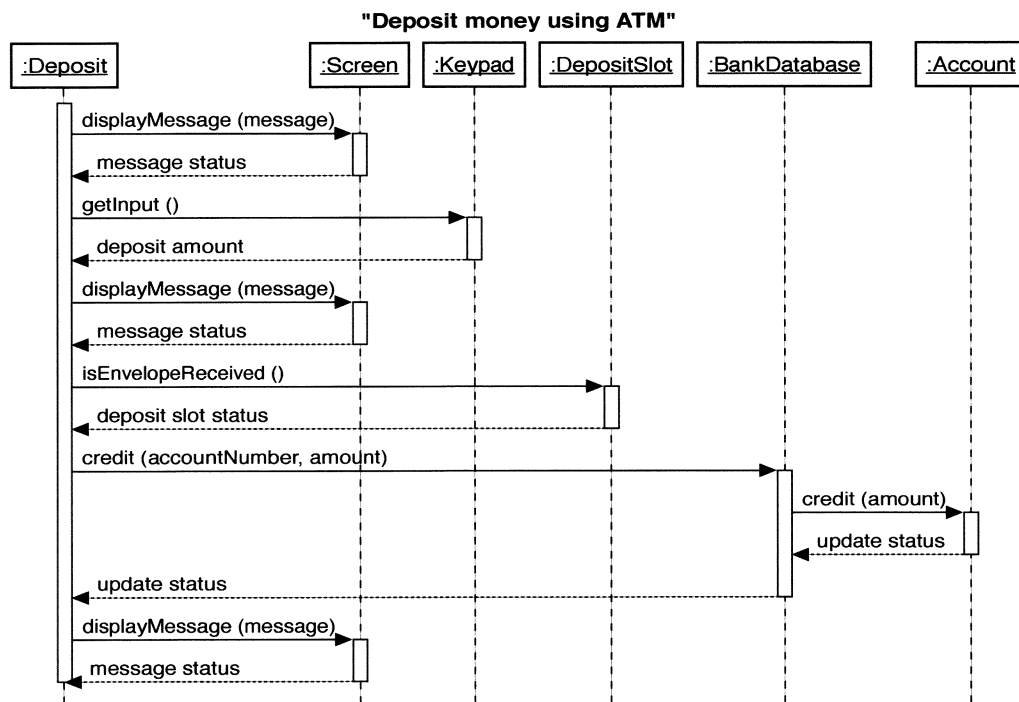
[SECTION A TOTAL 30 MARKS]

Section B

ANSWER ALL QUESTIONS FROM THIS SECTION

Questions in this section (total 70 marks) are practical and require you to perform analysis and design tasks. Questions 8-10 relate to the scenario described on pages 6 to 8. Allocate approximately 1.8 minutes per mark.

7. The following is a sequence diagram showing the process of making a deposit. Draw an extended version of this sequence diagram that also shows both:
- the possibility that, when asked for input using the Keypad, the user instead cancels the transaction; and
 - that if the envelope is not detected by the DepositSlot, then the transaction is cancelled, and an error message given to the user.



(5 marks)

8. Draw a use case diagram showing the scenario described on pages 6 to 8. Ensure that you make appropriate use of «extend» and «include» for instance to capture optional parts of the process. (15 marks)

9. Draw a BPMN diagram showing the process of a job being requested, and a team of **two** contractors being assigned and confirmed. Ensure that you use standard BPMN notation, that you have swimlanes for key entities involved, and that you capture the different possible situations. You can assume that contractors respond immediately, and that if either of them declines, the job is cancelled (i.e. the staff member will not try and find alternative contractors). Describe any other assumptions that you consider necessary to complete the design, or to clarify any ambiguity you believe exists. (25 marks)
10. Draw a *UML* Class Diagram that represents the data requirements of the case study presented on pages 6 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: Bob & Barb's Brilliant Builders

Background

The **Bob & Barb's Brilliant Builders** company is a small business that provides teams of contractors to perform tasks on building sites, both commercial and residential. The business has a database of casual contractors, and when a job request comes in, they assemble a team with the right skills to do the job.

As business has picked up, the manual system for tracking jobs and teams 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 prepared by a senior analyst hired earlier by the company.

Interview transcript

Below is the transcript resulting from the interview between senior analyst, *Alan Veriente* and owner of **Bob & Barb's Brilliant Builders**, *Barbara Black*.

ANALYST	Hi, I have been asked to talk to you about the main business activities of <i>Bob & Barb's Brilliant Builders</i> , however, for the purposes of today's interview, I want to focus specifically on the process of dealing with a job request.	ANALYST	What sort of basic information?
CLIENT	Sure, where do we start?	CLIENT	Location, contact person, contact details.
ANALYST	How about from the first thing <i>Bob & Barb's Brilliant Builders</i> does, when a client contacts them with a job?	ANALYST	Ok. And then what?
CLIENT	Righto, well the first thing we do is to make sure that the client is already in the database. If they aren't, then we need to add them and collect basic information.	CLIENT	Well, the next step is to find out from the client what the job entails. Basically, what we need to know boils down to when the job needs to start, how long it will take, and what sort of team is needed.
		ANALYST	I see. Then what?
		CLIENT	Then the staff member at <i>Bob & Barb's Brilliant Builders</i> thanks the client, promises to get back to them within a week, and starts the work of assembling

- the team.
- ANALYST Cool. And what's involved in assembling the team?
- CLIENT Well, that's the complicated part, and currently it's quite labour intensive. It would be really good to automate at least some of this. Basically, the staff member searches through the list of contractors to find people who have the right skills for the team, and they then ring contractors, one at a time.
- ANALYST You mentioned the "right skills", what do you mean by that?
- CLIENT Each contractor in the list has certain qualifications, for example, they might be a qualified electrician, or a plumber, or builder.
- ANALYST Oh, I see that makes sense. So if the client says that a given job requires, say, a plumber, and two builders, then the staff member will be trying to find three contractors with those skills to form a team?
- CLIENT Yes, that's right. For that team, the staff member would find a plumber in the list, ring them, and, if they were available, would record this, and go on to find two builders.
- ANALYST Is there an order in which contractors are contacted? In this example, does the staff member have to contact the plumber first?
- CLIENT No no, they can contact contractors in any order. And sometimes it isn't in sequence: they might leave a message, and contact the next person while waiting to hear back. But we don't want to ever over-staff a team: it looks really bad if we ask a contractor to join a team, and then have to say to them "sorry, in the meanwhile the team has been filled, so you're no longer needed". So, in this example, the staff member might contact up to three people in parallel, but would never contact a fourth person until someone declined.
- ANALYST I think I understand. So for a team you basically assign people tentatively. If they confirm, then they become definite, and if they decline, then you replace them.
- CLIENT Yes.
- ANALYST Right, and what information do you store about contractors?
- CLIENT Basically, their name, contact details, and their qualifications. We also try and keep track of periods of time when they are not available, but that's somewhat painful to manage at the moment - the folder of contractors can get rather full of sticky notes sometimes!
- ANALYST Yikes! We certainly should be able to improve that aspect. Presumably, if the staff member knows that a contractor is not available for a job, then they won't contact them for that job?
- CLIENT Yes, that is correct. A contractor has to be available for the *whole* period of time covered by the job in order to be considered for that job.
- ANALYST So, the system should avoid suggesting anyone who is not available for a job, or who does not have the right qualifications for the team?
- CLIENT Exactly, excellent!
- ANALYST Fantastic. You've also mentioned staff a few times - what sort of information do we store about them?
- CLIENT Name, contact details, when they started working with us, and their salary. We currently don't have different roles: everyone does everything.
- ANALYST Ok, so I think we've covered what we need about the process of forming teams. No, wait, you mentioned that the staff member gets back to the client within a week.
- CLIENT Yes.
- ANALYST How is that ensured?
- CLIENT When the client rings, the staff

- member makes a note on the shared whiteboard in the office. Usually they will call back, but if they are away, then another staff member will follow up.
- ANALYST Should the system include a reminder facility, instead of a whiteboard?
- CLIENT Yes, that would be great! Every morning, it could send a message to each staff member with the list of clients they need to get back to that day.
- ANALYST Presumably, the system should track whether a client has been responded to, so it does not remind the staff member again?
- CLIENT Yes, when the staff member contacts the client (within seven days), they update the system (currently the whiteboard). If the team has been confirmed, then we make a note of that, otherwise we make a note to contact the client again within seven days.
- ANALYST Ok. You mentioned that sometimes staff members are away?
- CLIENT Yes. In that case the reminder should go to a shared email account that we all can see.
- ANALYST Ok. But in order to know that, the system needs to know when staff members are away. So we should record that too?
- CLIENT Yes, I guess so.
- ANALYST Ok, I think we've covered most of the process. One last thing: what happens if a team cannot be confirmed?
- CLIENT If we cannot confirm a team within seven days, then the client can agree to wait for longer, or they can cancel the job.
- ANALYST And what happens if they cancel the job?
- CLIENT We notify any contractors who have accepted to be on the team for that job.
- ANALYST Excellent. I think I have more than enough information now to get started. Thank you very much for your time.
- CLIENT No, problem.

[SECTION B TOTAL 70 MARKS]

INFO201

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EXAMINATION
PAPER UNTIL
INSTRUCTED TO
DO SO**

