

EXAMINATIONS – 2014
TRIMESTER 2

SWEN 433
Web Information Systems
Engineering

Time Allowed: THREE HOURS

Instructions:

- Closed Book.
- Answer all questions.
- Read each question carefully before attempting it.
- Total marks are 180.
- No calculators are permitted.
- Paper dictionaries for translating between English and a foreign language are permitted.

Question 1. WISE Foundations and Web Services

[45 marks]

(a) [15 marks] Suppose you are working for a Wellington-based software development company that has been contracted by New Zealand's leading webshop TradeMe to implement a new version of their web information system. You want to convince your management and your client that a **service-oriented architecture (SOA)** is the right technology to use.

- i. Summarize what the **core principles** of SOA are.
- ii. Give **examples** for services that could be developed for TradeMe to be used by customers and/or business partners.
- iii. Briefly explain how **web services** can be used to implement SOA.

(b) [15 marks] Compare and contrast **big web services** to **RESTful web services**. *Discuss the advantages and disadvantages.* Which approach would you recommend for TradeMe? *Justify your answer.*

(c) [15 marks] Describe the purpose and the structure of **SOAP messages**. *How do SOAP messages relate to WSDL service descriptions published by the providers of services?*

Question 2. Web Data Management

[60 marks]

(a) [15 marks] **Allocation** is an important design primitive used in web information systems engineering. *Explain the purpose of allocation.* Compare and contrast the three **heuristics** for allocation that we discussed in the lectures.

(b) [15 marks] Briefly explain the properties **1-copy-equivalence** and **1-copy-serializability**. *Why is it hard to guarantee them in a web information system with replicated data?* Give an **example** to illustrate your answer.

(c) [15 marks] What compromise must be made in a web information system with replicated data if you need **high availability** and **partition tolerance**? *Explain what these properties mean, and justify your answer.*

(d) [15 marks] What is the purpose of the **2PC protocol** in web data management? *Discuss the strengths and weaknesses of 2PC.*

Question 3. NoSQL Databases

[45 marks]

(a) [15 marks] Explain the meaning of the term **big data**. *What particular challenges are typically associated with big data?* How are **NoSQL databases** expected to help us coping with these challenges?

(b) [15 marks] Describe the **data model** used by BigTable, one of the earliest and most influential NoSQL databases. *How does it compare to the relational data model?* What are **tablets** in BigTable, and how are they stored?

(c) [15 marks] **Document stores** and **column stores** are two major categories of NoSQL databases. *Discuss the similarities and differences between them.* When would you recommend to use these two categories? *Give examples.*

Question 4. Cloud Data Management

[30 marks]

(a) [15 marks] Compare and contrast the following **service models**: Software-as-a-Service (SaaS), Platform-as-a-Service (PaaS), and Infrastructure-as-a-Service (IaaS).

(b) [15 marks] What are the objectives of **multi-tenancy** in cloud data management, and what major challenges are associated with it? *Discuss the advantages and disadvantages of the following multi-tenancy approaches: shared-machine, shared-process, and shared-table.*
