



THE UNIVERSITY OF
MELBOURNE

Student Number _____

Faculty/Dept. Computing and Information Systems

Subject Number COMP90024

Subject Name Cluster and Cloud Computing

Writing Time 2 hours

Reading Time 15 minutes

Open Book Status Closed Book

Number of pages (including this page) 3

Authorised Materials: None

Instructions to Students: This examination is worth 50% of your final mark

Answer 5 out of any 7 questions. Please note that only the first 5 questions will be marked.

Each question carries 10 marks.

The number in square brackets after each sub-question represents the marks allocated to it.

Instructions to Invigilators: Please provide students with standard script books

No calculators are allowed

Paper to be held by Baillieu Library: Indicate whether the paper is to be held with the Baillieu Library.

Yes X No ☐

Extra Materials required (please tick & supply)

Graph Paper ☐ Multiple Choice form ☐

Question 1:

- A) Describe some of the erroneous assumptions that are often made in designing large-scale distributed systems. [5]
- B) Cloud Computing systems do not solve many key challenges of large-scale distributed systems. Discuss. [5]

Question 2:

- A) Explain the general principles that should underlie the design of Service-Oriented Architectures (SOA). [7]
- B) Explain why and how Cloud infrastructures have benefited from SOA. [3]

Question 3:

- A) *SOAP is dead; ReST is the future!* Explain this statement with regards to Representational State Transfer (ReST) based web services compared to Simple Object Access Protocol (SOAP)-based web services for implementing service-oriented architectures. [5]
- B) HTTP methods can be *safe* or *idempotent*.
 - a. What is meant by a *safe* HTTP method? [1]
 - b. Give an example of a *safe* HTTP method. [1]
 - c. What is meant by an *idempotent* HTTP method? [1]
 - d. Give an example of an *idempotent* HTTP method. [1]
 - e. Give an example of a HTTP method that is neither safe nor idempotent? [1]

Question 4:

- A) Explain the following terms in the context of high performance computing.
 - a. *Data parallelization* [1]
 - b. *Compute parallelization* [1]
 - c. *Wall-time* [1]
- B) Explain the role of a job scheduler on a high performance computing system like the University of Melbourne *Edward* cluster. What commands can be used to influence the behavior of the job scheduler in supporting parallel jobs running on single or multiple nodes (servers)? [3]
- C) Why is the accuracy of the wall-time important to users? [1]
- D) Compute parallelization of an application can be achieved through a variety of paradigms including *task farming* and *single program multiple data*. Describe these approaches and explain when they might best be applied. [3]

Question 5:

- A) There are many open challenges in delivering secure Clouds. Describe some of the technical and non-technical issues that currently exist for development and delivery of security-oriented Clouds. [4]
- B) The **Internet2 Shibboleth technology** as currently supported by the Australia Access Federation provides *federated authentication*.
 - a. Explain what is meant by this italicized term and discuss the advantages and disadvantages of the Shibboleth approach for security. [3]
 - b. Why isn't Shibboleth used to access Cloud-based systems more generally? [3]

Question 6:

- A) Describe the terms Cloud-based IaaS, PaaS and SaaS and give examples for each. [3]
- B) What are the advantages/disadvantages of public, private and hybrid clouds? [5]
- C) Describe some of the challenges in delivering hybrid Clouds? [2]

Question 7:

- A) Applications can be deployed across Clouds either through creation and deployment of virtual images (snapshots) or through scripting the installation and configuration of software applications.
 - a. What are the benefits and drawbacks of these approaches? [4]
 - b. Discuss the mechanisms used to support these approaches. You may refer to specific tools used to support these processes on the NeCTAR Research Cloud. [3]
 - c. Describe the typical steps that are required to support live migration of virtual machine instances using a Cloud facility such as the NeCTAR Research Cloud. [3]

--- END OF EXAMINATION ---