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 ---