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**Author/s:**

Computing and Information System

**Title:**

Cluster and cloud computing, 2015 Semester 1, COMP90024

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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 ---