CARDIFF UNIVERSITY
EXAMINATION PAPER

Academic Year: 2015-2016

Examination Period: Spring

Examination Paper Number: CMT202

Examination Paper Title: Distributed and Cloud Computing

Duration: TWO hours

Do not turn this page over until instructed to do so by the Senior Invigilator.

Structure of Examination Paper:

There are **THREE** pages.
There are **FOUR** questions in total.
There are no appendices.
The maximum mark for the examination paper is **60 marks** and the mark obtainable for a question or part of a question is shown in brackets alongside the question.

Students to be provided with:

The following item of stationery is to be provided:
ONE answer book.

Instructions to Students:

Answer **THREE** questions.

Important note: if you answer more than the number of questions instructed, then answers will be marked in the order they appear only until the above instruction is met. Extra answers will be ignored. Clearly cancel any answers not intended for marking. Write clearly on the front of the answer book the numbers of the answers to be marked.

The use of a translation dictionary between English or Welsh and another language, provided that it bears an appropriate school stamp, is permitted in this examination.

1 **(a)** In a distributed system it is difficult to achieve synchronous behaviour. Explain why this is the case. **[5]**

(b) Explain what is meant by the statement that a distributed system is *scalable.* **[5]**

(c) Describe the relationship between *parallel* and *distributed* systems. **[5]**

(d) Explain what is meant by the term *middleware.* What is the purpose of middleware? **[5]**

2 **(a)** Describe what is meant by the term *Remote Method Invocation* (RMI). **[5]**

(b) *Carrier Sensing Multiple Access with Collision Detection* (CSMA/CD) is a protocol which allows multiple processes to communicate using a single channel. Describe this protocol. **[5]**

(c) Explain the purpose of a *digital signature.* **[5]**

(d) Explain how a *public key cryptosystem* functions. State a major advantage of using a public key cryptosystem as opposed to a secret key cryptosystem. **[5]**

3 **(a)** How are *Peer-to-Peer* systems different from *Client-Server* systems? Explain the characteristics of peer-to-peer systems. **[6]**

(b) Describe the architectures of *Gnutella* and *Gnutella 2.* Explain how Gnutella 2 reduces queries flooding the network. Use diagrams if necessary. **[7]**

(c) What is the responsibility of a routing overlay? Compare and contrast *structured* and *unstructured* peer-to-peer systems, identifying advantages and disadvantages of each. **[7]**

4 (a) List, with a very brief description of each, the *five* main principles of Cloud Computing. **[5]**

(b) Suggest *two* benefits that Cloud Computing can offer over the use of locally-installed software. **[4]**

(c) Briefly define, describe, and identify the benefits of the following three types of cloud services: *Infrastructure as a Service* (IaaS); *Platform as a Service* (PaaS) and *Software as a Service* (SaaS). **[3]**

(d) Cloud computing services such as Amazon's EC2 assign users *virtual machines* (VMs) instead of allocating physical machines directly. Identify *four* major benefits that doing so provides to Amazon and/or the customer. For each of these benefits, provide a brief explanation of why it is desirable. **[8]**