CARDIFF UNIVERSITY
EXAMINATION PAPER

Academic Year: 2014-2015

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 **THREE** questions in total.
There are no appendices.
The maximum mark for the examination paper is 60 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 items of stationery are to be provided:
ONE answer book.

Instructions to Students:

Answer **THREE** questions.
The use of calculators is permitted in this examination.
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.

Please turn over

1.

a. How does cloud computing provide on-demand functionality? [4]

b. Describe the difference between scalability and elasticity. [4]

c. In synchronous communication, how do the *send* and *receive* operations interact? [4]

d. What is an overlay network? What benefits does the introduction of overlay networks bring? [5]

e. What are the different types of cloud services? Please, describe them briefly. [3]

2.

a. In RMI (Remote Method Invocation), what is the purpose of the name server in Pyro (Python Remote Objects) (or Registry in JavaRMI)? Describe the communications involved and their contents, when discovering and calling a method using RMI. Use diagrams if necessary. [7]

b. Briefly describe both the standard Napster architecture and the Gnutella (0.4) architecture, explaining the differences between the two. What are the similarities between: the Napster architecture when using replicated servers, and Gnutella when using super peers? Use diagrams if necessary. [6]

c. In publish-subscribe systems, explain how channel-based approaches can be implemented using a group communication service. Why is this a less optimal strategy for implementing a content-based approach? [6]

3.

a. NewCloudWorld has seen a tremendous increase in their business which they were not prepared to handle. It is a small company of 30 people with everyone trained and skilled to do every job. The company is currently performing a lot of computer-related repetitive tasks manually. This takes up at least 30% of their productive time in a week. What should NewCloudWorld do to handle this situation? [3]

b. What are the FOUR main limitations with distributed object-oriented middleware? How do component-based middleware overcome the limitations? [7]

c. The following diagram illustrates an RMI scenario between two objects. In the scenario, object *B* is a server-side remote object and object A is a client object that initiates a remote method invocation on one of *B*'s methods. Answer the following questions:

i. What does the request message sent from the client consist of? [2]

ii. Describe how the message is formed and sent from object *A* on the client side and received by the server, and then dispatched to object *B* to execute the particular method. [5]

iii. Describe how the reply message is formed and sent from the server, and then received and read by object *A*. [4]