CARDIFF UNIVERSITY

EXAMINATION PAPER

Academic Year:	**2018-2019**
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 TWO 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 items of stationery are to be provided:
ONE answer books.

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 departmental stamp, is permitted in this examination.

1 (a) Define what is meant by the term distributed system. Describe the relationship between computer networks and distributed systems. **[5]**

(b) Describe the purpose of distribution transparency in a distributed system. Name and describe two types of distribution transparency. **[5]**

(c) Describe the difference between a software architecture and a system architecture. Give one example of a software architecture and one example of a system architecture commonly used in distributed systems. **[5]**

(d) Define the difference between a structured and an unstructured peer-to-peer architecture. Describe how flooding may be used to search for data in an unstructured peer-to-peer architecture. **[5]**

2 (a) Define the difference between a process and a thread. Describe one advantage of using threads, as opposed to processes, in the context of a distributed system. **[5]**

(b) Describe what is meant by the term virtualisation. Explain why virtualisation plays an important role in cloud computing. **[5]**

(c) The low-level communication facilities of computer networks do not offer distribution transparency. Explain how middleware may be used to overcome this issue. **[5]**

(d) Define what is meant by a Remote Procedure Call (RPC). Describe the difference between synchronous and asynchronous communication. **[5]**

3 (a) Describe the Service-Oriented Architecture (SOA) which is a type of software architecture. Give an example of how such an architecture may be implemented. **[5]**

(b) Briefly describe how a SOAP web service works. What is the purpose of the Web Service Description Language (WSDL) in the context of a SOAP web service? **[5]**

(c) Describe why MapReduce is a useful programming model in the context of data processing. MapReduce programs run on a computing cluster; define what is meant by computer cluster. **[5]**

(d) Provide pseudocode for a MapReduce algorithm which computes the number of occurrences of each word in a large collection of documents. **[5]**

4 (a) Describe what communication security and authorisation security are concerned with. List one mechanism that may be used to implement each of these two parts of security. **[5]**

(b) Describe how an asymmetric (public-key) cryptosystem works. **[5]**

(c) Describe the purpose of access control. Describe how access rights may be modelled using an access control matrix. **[5]**

(d) Describe why mobile code poses a security threat. Describe a security mechanism which may be used to deal with such a threat. **[5]**