GRIFFITH COLLEGE DUBLIN

QUALITY AND QUALIFICATIONS IRELAND
EXAMINATION

POSTGRADUATE DIPLOMA IN SCIENCE IN COMPUTING

CLOUD PLATFORMS & APPLICATIONS
Module code: PGDC-CPA

MASTER OF SCIENCE IN BIG DATA MANAGEMENT AND ANALYTICS

CLOUD PLATFORMS & APPLICATIONS
Module code: MSCBD-CPA

MASTER OF SCIENCE IN COMPUTING

CLOUD PLATFORMS & APPLICATIONS
Module code: MSCC-CPA

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External Examiner(s):	**Dr Mubashir Husain Rehman** **Dr William Clifford**
Date: 12th August 2024	**Time: 2.15-5.15**

THIS PAPER CONSISTS OF SIX QUESTIONS
FIVE QUESTIONS TO BE ATTEMPTED
ALL QUESTIONS CARRY EQUAL MARKS

IN ALL CASES, CANDIDATES SHOULD *READ THE ENTIRE QUESTION,* BEFORE ANSWERING ANY PART
THE USE OF NON-PROGRAMMABLE CALCULATORS ARE PERMITTED

QUESTION 1 (Cloud Models and Cloud Construction)

(a) Define the term vendor lock in. Explain the issues this causes when a customer wishes to move from one vendor to another. Identify the cause of vendor lock in in all three models of cloud computing and evaluate how these would affect the customer attempting to move to a different vendor

(10 marks)

(b) Compare and contrast homogeneous compute and heterogeneous compute in a cloud. Analyse why homogeneous compute is favoured in such an environment. Summarise why it is not possible to have an entirely homogeneous compute in a cloud at all times.

(10 marks)

Total (20 marks)

QUESTION 2 (Virtualisation and Containerization)

(a) Analyse the differences between Bare-metal and Hybrid hypervisors, make reference to competition for resources and control of resources in your answer. Based on the analysis explain why cloud implementations tend to favour the bare metal hypervisor.

(10 marks)

(b) Illustrate with the aid of diagrams the main difference between the containerisation and virtual machine approaches. Evaluate how this difference affects the applications and libraries that can be run in both approaches. Analyse how containers can be a more efficient use of resources compared to virtual machines as a result of this difference.

(10 marks)

Total (20 marks)

QUESTION 3 (Deployment models and Energy Optimisation)

(a) A bank would like to move their operations and infrastructure to a cloud based environment but they would like to retain full control of data at all times. What is the only viable cloud model for this case? Explain how this model ensures control over data and how such an environment would be setup and applications migrated to it. Evaluate what advantage if any this provides over a non-cloud environment.

(10 marks)

(b) Before a cloud is constructed there are decisions that can be taken which will affect overall power and cooling of a cloud. Justify this statement by analysing the effect that two such classes of decisions can have on the power and cooling requirements of a cloud.

(10 marks)

Total (20 marks)

QUESTION 4 (Cloud Security and Programming Techniques)

(a) Evaluate how PaaS API's can be insecure and summarise two ways such an API can be insecure and comprimised. Determine if either insecurity is intentional and explain who is responsible for securing the API.

(10 marks)

(b) Define the term Memcache and explain how one can be used to speed up a cloud based application. Evaluate what are the best and worst kinds of data to use with this approach. Analyse in what case a memcache would perform worse than direct storage.

(10 marks)

Total (20 marks)

QUESTION 5 (Cloud Storage and Reference Architecture)

(a) Explain the purpose of a file content modification notification in the Chubby lock system. Analyse how such events can reduce the overall network traffic and file reads in a file system.

(10 marks)

(b) Using the NIST actor model illustrate with the aid of a diagram the relationship between a cloud consumer, cloud provider, and cloud carrier. Define the the term SLA and explain how it would apply to this particular relationship. Is it possible for multiple SLAs to fail in this scenario and if so how?

(10 marks)

Total (20 marks)

QUESTION 6 (Cloud Algorithms and Mathematics)

(a) When establishing a theoretical limit for speedup for a parallel application in a cloud it is possible to calculate this while allowing the problem size to vary with the number of processors. Define the law that establishes this limit and derive its proof

(12 marks)

(b) Compare and contrast four approaches to resource management in a cloud based system

(8 marks)

Total (20 marks)