

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

Lecturer(s): **Barry Denby**
External Examiner(s): **Dr Mubashir Husain Rehman**
Dr William Clifford

Date: 16th May 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

QUESTION 1 (Cloud Models and Cloud Construction)

- (a) Analyse all three models of cloud computing and evaluate what elements the vendor and customer are responsible for in each.

(10 marks)

- (b) Clouds tend to be constructed with an entire separation between data and processing. Using Amazon AWS as an example explain how a full reply would be generated by a request coming from the public internet. Make sure to reference all components involved, specifically NAT and the cloud interconnect in your answer.

(10 marks)

Total (20 marks)

QUESTION 2 (Virtualisation and Containerization)

- (a) Explain the purpose of the Popek and Goldberg conditions for virtualisation. Analyse how virtualisation would be affected if each one of the conditions was not present. Determine how the use of a bare metal or hybrid hypervisor would affect one of these conditions.

(10 marks)

- (b) Assuming you have a new Operating System what steps would be needed to get containerisation software like Docker running on this new operating system. Explain any four OS level features required to enable containerisation to function.

(10 marks)

Total (20 marks)

QUESTION 3 (Deployment models and Energy Optimisation)

- (a) Define the hybrid cloud and explain how such a cloud is used in a cloud bursting scenario. Summarise how this would affect irregular demand spikes and the resources required by an organisation for running their own cloud

(10 marks)

- (b) Differentiate between the load balancing and energy optimisation approaches. Assume you have 8 VMs each with a load of 0.3 how would this be distributed in both approaches if you have four physical nodes. Show how both approaches would react if you introduce two additional VMs each with a load of 0.5 and 2 additional physical nodes.

(10 marks)

Total (20 marks)

QUESTION 4 (Cloud Security and Programming Techniques)

- (a) Define the term Abuse of the Cloud. Summarise four different ways a cloud could be used in this way. **(10 marks)**
- (b) Summarise how the process of code profiling would work in a cloud based application. Explain how the law of diminishing returns would apply here. **(10 marks)**

Total (20 marks)

QUESTION 5 (Cloud Storage and Reference Architecture)

- (a) The Chubby lock server system was designed in a paranoid way with many failsafes introduced. Defend this statement by explaining what problem occurs if the lock system goes offline and analyse four techniques used to prevent such deadlocks from occurring in the system. **(10 marks)**
- (b) Using the NIST actor model illustrate with the aid of a diagram the relationship between a cloud consumer, cloud broker, and one or more cloud providers. Evaluate why such a relationship would occur and how payment would work in such a relationship. **(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 fixing the problem but allowing the number of processors to vary. Define the law that establishes this limit and derive its proof **(12 marks)**
- (b) Cloud based schedulers are used to manage resources in the cloud. Explain what aspect of resources these schedulers manage. Compare and contrast three classes of cloud based schedulers and determine why one particular class of scheduler is used and determine why the other two classes are not used. **(8 marks)**

Total (20 marks)