

**TECHNOLOGICAL UNIVERSITY DUBLIN**  
**Grangegorman**

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TU856 - BSc. (Honours) Degree in Computer Science  
TU857 - BSc. (Honours) Degree in Computer Science (Infrastructure)

*Year 3*

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*SEMESTER 1 EXAMINATIONS 2022/23*

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***CMPU 3007 Cloud Computing***

**Internal Examiner(s):**

Paul Laird  
Dr. Paul Doyle

**External Examiner(s):**

Sanita Tifenale  
Dr. Charles Markham

**Instructions To Candidates:**

***Answer all questions***

**Exam Duration:**

**2 hours**

1

(a) Describe how the use of virtualisation can improve scalability, the ability to add additional capacity; and website and resource availability.

(10 marks)

(b)

i. Explain in your own words the concept of Platform-as-a-Service (PaaS), noting differences from Infrastructure as a Service and Software as a Service.

(5 marks)

ii. Explain the role of containerisation in deployment of Platform-as-a-Service and outline the benefits this strategy provides.

(5 marks)

iii. What advantages does Platform-as-a-Service have over conventional software development processes for the customer?

(5 marks)

iv. What potential drawbacks are associated with moving software development and deployment to the cloud?

(5 marks)

v. How can these drawbacks be mitigated?

(5 marks)

(c)

i. Describe the concepts of Infrastructure-as-code and Configuration-as-code in relation to cloud computing

(3 marks)

Explain their impact on:

ii. Security

(3 marks)

iii. Reliability

(3 marks)

iv. Scalability

(3 marks)

v. Ability to reason about and debug problems.

(3 marks)

2

(a) Explain the central importance of source control management systems such as git to modern cloud-based development, from coding all the way to deployment to production.

(9 marks)

(b) Open source projects, standards and interoperability considerations have transformed software procurement decisions over the last two decades, with very little remaining of old 'shrink-wrap' proprietary software using proprietary formats locking users into continuing to use the same product. Discuss Software as a Service in terms of whether vendor lock-in has been eliminated or continues by other means.

(8 marks)

(c) Discuss the importance of independence when assessing the probable reliability of a system comprising multiple redundant instances of a service.

(8 marks)

3

(a) Outline the four standard *deployment models* for cloud computing, differentiated by the degree and nature of co-tenancy, providing the advantages and rationale for each model, as well as any key trade-offs involved in achieving the advantages listed.

(16 marks)

(b) Security is often a concern in migrating to the cloud, whether justified or not, however in some circumstances deployment of resources to the cloud can improve the security of assets not stored on or running in the cloud. Explain why this is the case.

(9 marks)