DUBLIN INSTITUTE OF TECHNOLOGY

BSc. (Honours) Degree in Computer Science

Year 3

WINTER EXAMINATIONS 2015

SOFTWARE ENGINEERING III [CMPU3038]

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WEDNESDAY 17TH JANUARY   9.30 A.M. – 11.30 A.M.

2 HOURS

ANSWER **THREE** QUESTIONS OUT OF **FOUR**.

ALL QUESTIONS CARRY 33 MARKS EACH.

ONE COMPLIMENTARY MARK SHALL BE AWARDED.

Note: If asked in any question to provide an example of code, you may use any appropriate language of your choice or pseudo code in your answer.

1. (a) In the context of *Object Oriented Analysis and Design*, when designing the structural model, what are the implications of designing a *bi-directional association* between two classes in terms of its implementation (as opposed to a *uni-directional association*). Illustrate your answer using code examples.

[10 Marks]

(b) **(i)** Explain the *Principle of Least Knowledge*. As part of your answer, outline *three* practical guides to object communication that Demeter promotes. Use UML to illustrate your answer.

[9 Marks]

(ii) Discuss, using an example of your choosing, how a *behavioural model* (sequence diagram) could be created which fully and correctly realises a specific use case but does not conform to its *structural model* (class diagram).

[14 Marks]

2. (a) Outline what is meant by *Data Access Patterns*.

[4 Marks]

(b) Choose one data access pattern that you are familiar with and provide the following:

(i) Outline the problem it addresses.

[5 Marks]

(ii) Provide an example structural model (class diagram) that would illustrate its implementation.

[8 Marks]

(iii) Describe, in detail, an example context in which it might be utilised - ensure you provide an architectural perspective as part of your description and use code examples to illustrate your answer.

[16 Marks]

3. (a) Outline the intent of the *Model View Controller (MVC)* architectural pattern.

[4 Marks]

(b) Describe how the *Java Enterprise Edition (JEE)* technology stack can be utilised to implement the MVC pattern.

[11 Marks]

(c) When considering a web based application, a HTTP client (e.g. a browser) can send a HTTP request to the server. In the context of JEE there is a Java runtime environment on the server. Within this runtime environment, a *HttpRequest* object is passed which contains the data sent from the client.

    (i) Discuss any issues that arise from this in terms of the data being contained in a object that is specific to the HTTP protocol.

[6 Marks]

    (ii) Explain how the *Context Object* pattern can help address these issues.

[12 Marks]

4. *Object Relational Mapping (ORM)* is an area within *Object Oriented* development that deals with mapping objects that need to be persisted to a relational database persistence store.

(a) Outline the main difference between the goals of an OO model and the goals of a relational model.

[4 Marks]

(b) Mapping an object inheritance structure to a relational database is one of the main issues that ORM addresses. Discuss *two other* issues that need to be addressed when considering ORM.

[8 Marks]

(c) Using an example of your choice, describe three ways in which object inheritance can be mapped to a relational database.

[9 Marks]

(d) ORM applies to both the design of a system and the runtime execution of object persistence. For *each* of these two cases, discuss *two* features of an ORM tool that would benefit the development/execution of an OO system.

[12 Marks]