

**Very important instructions and information to candidates**

(Please read and heed)

***Point 1 (structure)***

You are allocated a **total of two hours** for this paper. Read any question carefully before attempting it. This paper contains **six questions in all**. The questions are divided into **two sections (A & B)**. You are to attempt **all** the questions in Section A and **any two questions** from Section B. This paper will be marked out of 100, but carries an 80% weighting of the mark obtainable for this study-unit as a whole. Your course-work carries the remaining 20%.

***Point 2 (clarity)***

It is important that you use legible handwriting and understandable English grammar. **Please be warned** that work presented in unintelligible handwriting and/or unclear English **will not be considered** for marking. The same applies to diagrams and other non-textual representations. ALL WRITTEN AND DRAWN ENTRIES MUST BE IN INK. Entries in pencil will NOT be considered for marking.

***Point 3 (maturity)***

You should present your thoughts on paper in a mature and reasoned fashion, using interplay of concepts **expounded in class**. Arguments should not just be stated but should follow from fundamentals. **This is a key consideration** and will be highly valued.

***Point 4 (presentation)***

You should keep **all parts** of any given question together. Scattered answers **will be penalised** or may even **not be considered at all** when marking.

The first five minutes of the exam is reading and noting time.

**Mark allocation by question.**

**Section A:**

Question 1 – Compulsory : 25 marks

Question 2 – Compulsory : 25 marks

**Section B:**

Question 3 – Selectable : 25 marks

Question 4 – Selectable : 25 marks

Question 5 – Selectable : 25 marks

Question 6 – Selectable : 25 marks

**Obtainable total:** 100 marks (*i.e. A=25+25; B=25+25*)

**The use of calculators is allowed.**

## **Section A – Two compulsory questions (various topics).**

### **Question 1 [Generic] (a compulsory question for 25 marks)**

(a) Your organisation has traditionally been involved in the production of software solutions for stock management. Due to an insurgence in iGaming business, there was increased demand for software solutions that exhibit demonstrably correct payment and gaming behaviour that can then be certified by the relevant authorities. The iGaming area is also one that is dynamic in nature with companies competing by offering frequently changing new functionality and features. Your organisation needs to understand what impact diversifying their activity into these sort of software solutions would entail in terms of 1) development life cycle(s) and 2) quality considerations. You are asked to provide a report on this.

*Suggestion: Please note the relatively high mark associated with this question. You are expected to provide a well-structured, well-reasoned and justified treatment based on several issues explained and discussed during class.*

*[18 marks (5-SDLCs; 5-quality; 8-reasoning)]*

(b) The modern data generation and data availability landscape, as well as the increasing prevalence of Big Data corpora can be considered as the “new software development platform in much the same way as the availability of the personal computer was in the past” – explain what this means. Provide one concrete example in support of your explanation.

*[7 marks (4-meaning; 3-example)]*

### **Question 2 [Generic] (a compulsory question for 25 marks)**

(a) Many people tend to conflate (i.e. confuse and interchange the meaning of) the notions of “Cloud Computing”, “Cloud Technology” and “Big Data”. Can you help clearly differentiate between these notions by giving separate explanations for each notion? Furthermore, there is a growing understanding that the notion of “Big Data” refers to the generation and use of “large” amounts of data. Is this the true nature of “Big Data”? Explain and also provide one concrete example in support of your explanation.

*[13 marks (6-differentiate notions; 3-true nature; 4-example)]*

(b) One of the most important and “business critical” software quality attributes is that of maintenance. In terms of the modern professional software production business, how is maintenance “business critical”? Provide one concrete example of this “criticality”. Being such an important software quality attribute, can you list another two software quality attributes that it is closely related to, and furthermore, explain the relationships?

*[12 marks (3-how; 3-example; 6-relations & explanation)]*

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End of Section A (Section B on next page)

## **Section B – Four selectable scenario-based questions from which to select any two.**

### **Question 3 [SDLCs and Quality]** *(a selectable question for 25 marks)*

- (a) Company “X” has been using a traditional software development lifecycle (SDLC) based on the Waterfall method, as a procedural framework to develop software solutions mainly in the area of standard office applications. Due to current market realities, “X” now wishes to diversify its products to include solutions that are not as run-of-the-mill and as mainstream as those it currently handles.

Provide “X” with a more suitable SDLC in line with their strategy. Please be sure to explain all your reasoning and to clearly demonstrate a sequence of arguments and statements that forms a chain leading to your eventual replies.

**All your reasoning should be based on matters, issues and situations brought up and discussed during class. All decisions and statements must be reached or made in a logical and sequential manner and must be justified, through relation with lecture material, to be accepted for assessment. This is an objectively assessable exercise and therefore cannot be a showcase of personal opinion.**

*[14 marks (3-SDLC validity; 6-explanation & justification; 5-argument structure)]*

- (b) Company “X” wishes to improve its maintenance record. It understands that an important aspect of product quality is its maintainability. In a software product market of quickly converging technologies and products, maintenance might well prove to offer a valuable competitive edge. Explain what this means in clear terms.

*[6 marks]*

- (c) Further to question 3(b), clearly relate the notions of complexity and sophistication to the software solution quality aspect of maintainability.

*[5 marks]*

### **Question 4 [Agile development]** *(a selectable question for 25 marks)*

- (a) In your own words describe the business case for Agility and in doing so explain the Agile Philosophy and how it defers from a traditional approach?

*[9 marks (5-business case; 4-defers)]*

- (b) Given that before we start any project we assess the suitability of Agility (suitability Filter), clearly show and explain the difference between System Characteristics and Critical Success Factors?

*[8 marks]*

- (c) The first phase of the Agile Life cycle is the "Feasibility Study", in your own words, describe the purpose of the Feasibility Study phase. What are the risks that could be encountered if this phase was not given its due importance?

*[8 marks (5-purpose; 3-risks)]*

### **Question 5 [Big Data]** *(a selectable question for 25 marks)*

A local manufacturing company needs a way to monitor logs generated by production machines in real-time. The logs contain details about the operation being performed by the machine as well as other relevant operating conditions, such as temperature and humidity levels.

- (a) Describe what the velocity aspect of big data is, giving two different examples of where one can find velocity.

*[5 marks (1-definition; 4-examples)]*

- (b) In the context of the given scenario, what do you think are the requirements of a stream-processing system.

[6 marks]

(c) What is the “stream model” and what are the constraints that are present in a Data Stream Management System (DSMS)?

[6 marks]

(d) Describe the concept of a “sliding window”. In your answer, use the given scenario to supplement your answer with a concrete example of what the “sliding window” would look like.

[8 marks (4-description; 4-example)]

**Question 6 [Testing] (a selectable question for 25 marks)**

(a) Describe and distinguish between the 4 levels of testing in the testing pyramid. Why are the testing levels depicted in pyramid form? Who is responsible for creating and maintaining each testing level?

[10 marks (8-testing levels and responsibility; 2-pyramid form)]

(b) The method `plotPixel(x,y)` plots a pixel at the point  $x,y$  on a screen that has a horizontal resolution of 1920 pixels and a vertical resolution of 1080 pixels. It is impractical to test 2,073,600 combinations so you have been asked to provide a feasible set of test cases which provide a reasonable level of confidence in the method if they pass correctly.

Provide a set of test cases in the form  $\{(x,y)\}$  (e.g.  $\{(5,5), (123,234), \dots\}$ ) to meet these expectations. Explain the test case design strategy you used to specify these test cases.

[9 marks (4-test cases; 5-test design strategy)]

(c) Explain the notion of “code smells” and their usefulness within software engineering. Describe two examples of “code smells”.

[6 marks (2-explanation; 4-examples)]

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No more questions

All scenarios and examples in this paper are hypothetical; any resemblance to existing systems, scenarios or situations is unintentional and purely coincidental.  
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