

Two hours - online

The exam will be taken on line.
This paper version is made available as a backup

Appendix A is located at the back of the exam

**UNIVERSITY OF MANCHESTER
SCHOOL OF COMPUTER SCIENCE**

Software Evolution

Date: Thursday 31st May 2018

Time: 14:00 - 16:00

Please answer all Questions.

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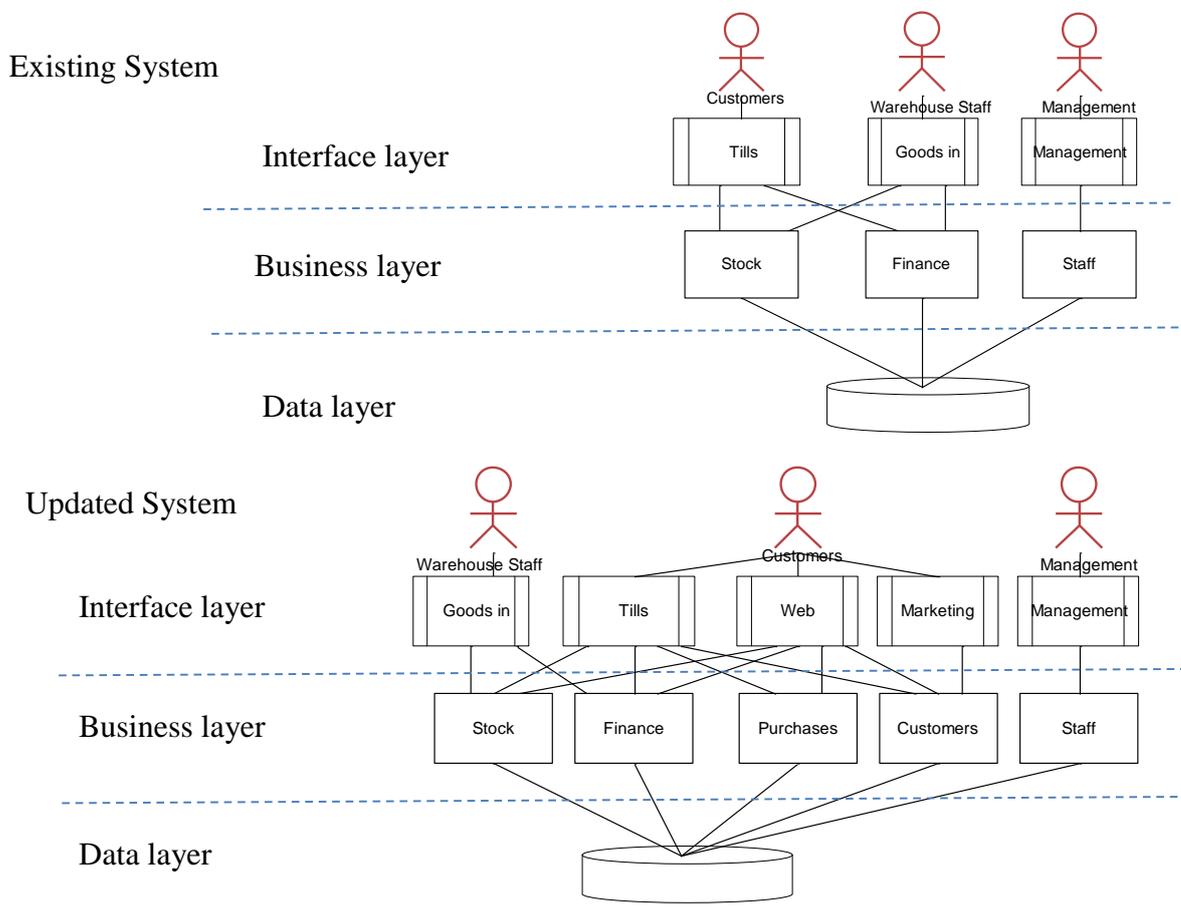
This is a CLOSED book examination

The use of electronic calculators is NOT permitted

[PTO]

Question 1.

- a) Give three reasons why an initially well designed software programme will need to change. [3 marks]
- b) The creation of gateways is a key element of migrating legacy systems; describe in general the advantages and disadvantages of using gateways. [4 marks]
- c) A small upmarket supermarket chain has recently been placed into receivership. A set of venture capitalists believe that they can make the chain profitable again through the introduction of a loyalty card for existing customers and the development of an online shopping portal. To support this expanded functionality, the IT system used by the chain must be updated. Consultants have already analysed the existing system to document it and propose an updated system (see below). You have now been employed to oversee the actual migration process, your employers want details of how you plan to perform the migration and the reasons why you believe your approach will maximise the company's profit. [8 marks]



- d) For a managed commercial software product, any change (bug fix or enhancement) uses a change request process. Describe the major stages of such a process including who initiates the stage and its purpose from a commercial perspective. [5 marks]

Question 2.

- a) A/B testing is a commonly used experimental method for understanding the potential impact of proposed changes to a user experience. Briefly identify the main risk associated with: [4 marks]
- i) An underpowered A/B test
 - ii) An overpowered A/B test
- b) You're currently working as a data scientist in a small e-commerce company. A designer in the company has proposed a change to the user interface that involves showing the top 6 local best-selling items to each customer after they have added an item to their basket. Clicking on any of the six items will take the user to the product page for the pictured item. The designer believes that this new widget will encourage customers to add more items to their basket, thus spending more money with your company. A high level manager opposes the new change, considering that it may cause customers to become distracted and not complete their purchases. You are asked to help develop an A/B test that establishes whether launching the new UI will be beneficial to your company. The existing and proposed alternative interfaces are shown in Appendix A.
- i) Identify a key metric, a metric of interest and a potential proxy metric to be measured during A/B tests of the new user interface design. For each metric briefly justify its relevance to the presented scenario. [6 marks]
 - ii) You plan to test the designer's new user interfaces on the main "desktop" web version of your e-commerce site only, which receives around 4,700 unique visitors per day. You need to test both versions of the user interface, with a sample size of around 5,000 for each test cell.

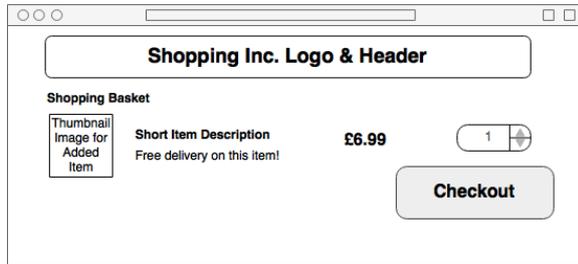
Describe the primary trade-off when considering what proportion of your user base to allocate to this test. You should support your answer with concrete statistics based on the numbers above. [4 marks]
- c) Briefly summarise the difference between "A/B" testing and "C/D" (Code/Deception) experimentation. You may use an example to support your answer if you wish. [2 marks]
- d) At a basic level, reusing software, or software elements, sounds attractive because it reduces the amount of implementation required. However, it is usually not a zero cost option. Explain why current and future difficulties can arise then attempting to reuse software. [4 marks]

Question 3.

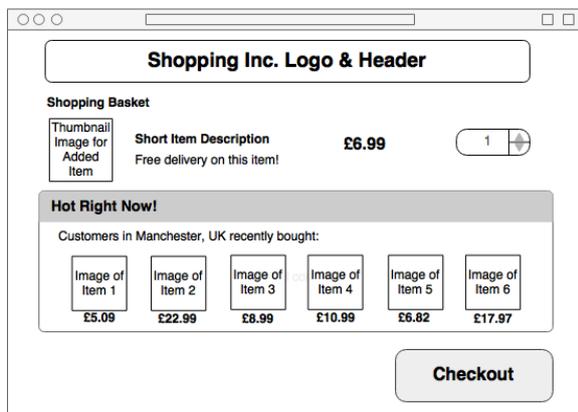
- a) Standards are one element of software quality management. Describe the purpose of both company external standards and company internal standards. [4 marks]
- b) Outline the advantages and drawbacks that stem from the use of both company external and internal standards in software quality management. [4 marks]
- c) Describe the benefits that stem from a code review in a software development process. [4 marks]
- d) You are part of a software team developing a Java based app for deployment on an Android phone. The team leader has appointed you as the team member responsible for overseeing quality control for the software being developed. To give quantitative numbers you need to select metrics that will be automatically measured for the software. State, with reasons, four metrics that you will include in your selection. [4 marks]
- e) One approach to increasing the productivity level of software developers is to raise the abstraction level at which they work. Generative programming gives one way of achieving this. Explain with reasons, why generative programming has the potential to allow developers to work at higher levels of abstraction and outline, again with reasons, the drawbacks that may prevent it from being widely adopted. [4 marks]

Appendix A – Existing and Proposed Alternative User Interfaces

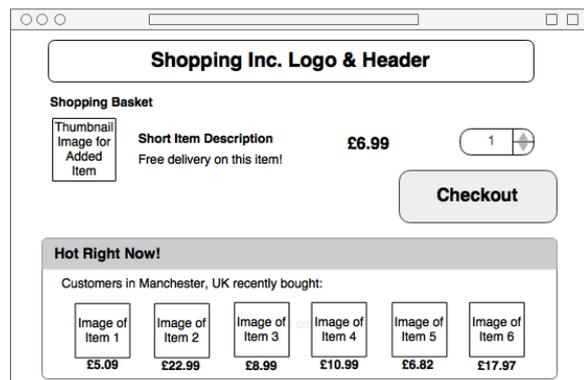
Current User Interface:



Proposed User Interface:



Option A (Checkout button below hot list)



Option B (Checkout button above hot list)

END OF EXAMINATION