

One and a half hours

Question ONE is COMPULSORY

**UNIVERSITY OF MANCHESTER
SCHOOL OF COMPUTER SCIENCE**

Software Engineering

Date: Tuesday 20th May 2014

Time: 09:45 - 11:15

Answer Question ONE and also either Question 2 or Question 3

This is a CLOSED book examination

The use of electronic calculators is NOT permitted

[PTO]

Question 1**This question is COMPULSORY**

a) Given the following rules:

1. “There can be no more than 50 hours driven by any one driver in any one week.”
2. “There can be no more than 5 hours driven by any one driver without a break.”
3. “A driver may work up to 9 hours in a single day.”
4. “A driver may specify up to two resting days for each week in which they will not be available for work.”

State which rule(s) are for driver scheduling and which ones are for driver rostering.

(4 marks)

b) Briefly explain what driver scheduling and driver rostering are for and the difference between them. (3 marks)

c) Explain the principles of data abstraction, information hiding and encapsulation in Object-Oriented Programming. (3 marks)

d). Why is it important for a software development team to have physical meetings rather than virtual ones whenever possible? (2 marks)

e). Briefly explain the two types of coupling defined in the lectures. (2 marks)

f). For each of the types of coupling you stated in part e), give an example of how you kept it low in your IBMS implementation. (2 marks)

g). What is the difference between *integration testing* and *system testing*, as defined in the lectures? (2 marks)

h). Why, in a conventional approach to testing, is it important for the person who tests the code to be different from the one who wrote it? (2 marks)

Question 2**Answer this question OR question 3**

- a) What are the three basic views captured by object-oriented modelling? Briefly explain how each view is represented in UML diagrams. (3 marks)
- b) Explain two common methods for program organisation and what object-oriented problems these organisations attempt to address. (4 marks)
- c) Briefly explain the role played by each of the components in the MVC architecture. (3 marks)
- d) Briefly explain the role of GRASP principles in object-oriented software development. (2 marks)
- e) Explain how your IBMS implementation was, or could have been, consistent with five different GRASP principles, *other* than low coupling. (5 marks)
- f) “A restaurant has different kinds of staff members – waiters, chefs, managers etc. One member of staff may do different jobs at different times, e.g. a manager may act as a waiter.”

There are two different ways to model the information above using inheritance – one is correct, the other is not. Draw a UML class diagram which shows the correct way. For full marks you need to use correct UML notation as well as the correct model. (3 marks)

[PTO]

Question 3**Answer this question OR question 2**

You are designing a point-of-sale software system for a convenience store. You want to apply some of the business application patterns you have learned from this course to your design.

- a) Use a UML class diagram to represent a shopping cart (assuming the shopping cart is not empty). Your diagram should show: (1) the multiplicities of all relationships; (2) essential attributes of the classes and essential operations performed by them. Explain the business patterns used in your design. (5 marks)
- b) Use a UML class diagram to represent a cashier who is processing the sale (assuming the sale is happening in the store). Your diagram should show: (1) the multiplicities of all relationships; (2) essential attributes of the classes and essential operations performed by them. Explain the business patterns used in your design. (5 marks)
- c). Briefly explain the term “bug density” as used in the lectures, and how it is related to the total size of the code. (2 marks)
- d). Suppose the complete IBMS system is around 1.5 million lines of code. It is written mostly in Java by a highly competent team using agile practices such as pair programming and is thoroughly tested. Using the estimates of bug density given in the lectures, approximately how many bugs would you expect to be in the system at the point it is deployed? Hint: first calculate the *minimum* there are likely to be. (3 marks)
- e). After deployment, would you expect many of the remaining bugs to be found quickly? Briefly state why or why not. (1 mark)
- f). The complete IBMS system would allow the controller to deal with all sorts of situations such as bus breakdowns, driver illness etc. Since a controller will have been working with the development team throughout, you can be confident that the user interface is satisfactory, and that the controllers’ subsystem works correctly in the development team’s office. State two things you would need to check carefully during system testing of this part of the system. (2 marks)
- g). The complete IBMS system would allow passengers to access timetable, route planning and real-time information on a range of mobile devices. State two things you would need to check carefully during system testing of this part of the system. (2 marks)

END OF EXAMINATION