

Two hours - online

The exam is hybrid and will be taken on line and answered on paper.

This paper version is made available as a backup
In this event, only MCQ answers written in the boxes on the exam paper will be marked.

EXAM PAPER MUST NOT BE REMOVED FROM THE EXAM ROOM

**UNIVERSITY OF MANCHESTER
SCHOOL OF COMPUTER SCIENCE**

Component-based Software Development

Date: Tuesday 5th June 2018

Time: 09:45 - 11:45

This is a hybrid examination with sections to be answered online and questions to be answered on paper.

**Please answer All Questions in Section A online
and All Questions in Section B in a separate answerbook**

© The University of Manchester, 2018

This is a CLOSED book examination

The use of electronic calculators is NOT permitted

[PTO]

*Section A contains
multiple choice
questions (MCQs) and
is restricted for
publication*

Section B

Answer all the questions in this section.

Diagrams should be drawn and labelled clearly in paper answer books which should be submitted offline.

2. Consider a home heating system which consists of a master switch, a thermostat, a boiler and a status indicator. The master switch is used to turn on/off the system. The thermostat is used to set the desired temperature in the house. The thermostat also contains a temperature sensor that measures the current temperature, and a controller that (i) calculates the difference between the current temperature and the desired temperature and (ii) sets the heat level for the boiler required to maintain the desired temperature. The status indicator continuously takes readings from the boiler. If the temperature of the boiler is above the safe value, the status indicator instructs the master switch to turn off the system for a specified time interval; otherwise the system will keep on working.

Use the X-MAN component model to build a system for the home heating system. You should explain your answer clearly.

- i) Identify the required components. For each component, list its provided services. (5 marks)
 - ii) Use X-MAN notation to implement the system. Also identify the connectors needed to construct the system. (5 marks)
 - iii) Identify the services provided by the system. (5 marks)
 - iv) Specify 5 data channels in the system. (5 marks)
3. Consider the home heating system in Question 2. Use EJB to build this system. You should explain your answer clearly.
- i) Identify the required beans. For each bean, list its interface. (5 marks)
 - ii) Design the system using the identified beans. (5 marks)
 - iii) Use a suitable notation to express the control flow in your system. (5 marks)
 - iv) Identify any client application and interfaces involved. (5 marks)