King’s College
London

This paper is part of an examination of the College counting towards the award of a degree. Examinations are governed by the College Regulations under the authority of the Academic Board.

**Degree Programmes**  BSc, MSc

**Module Code**  6CCS3SIA
**Module Title**  Software Engineering of Internet Applications
**Examination Period**  May (Period 2) 2014

**Time Allowed**  Two hours
**Rubric**  ANSWER THREE OF FOUR QUESTIONS.

All questions carry equal marks. If more than three questions are answered, the answers to the first three questions in exam paper order will count.

**Calculators**  Calculators are not permitted
**Notes**  Books, notes or other written material may not be brought into this examination

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1. **a.** (i) Explain what is meant by the *accessibility* of a web application.

(ii) Describe an approach for improving web application accessibility.

[15 (5 + 10) marks]

**b.** (i) Explain how finite state machines can be used to design the interaction between a web application and its users.

(ii) What do states and transitions in the state machine represent in such design diagrams?

[10 (5 each part) marks]

**c.** An online banking system allows account-holding customers to login, using two successive login screens, the first for entry of their ID number and password, the second for 3 selected digits of their secret number. Only if both sets of information are correct is a customer able to progress to an account summary page, which lists all their accounts. If any security information is incorrect they are redirected instead back to the initial login page. From the account summary page a customer can go to the account details page for any of their accounts. Customers can also logout from the system (if they are logged in).

Draw an interaction state machine diagram for this system.

[25 marks]
2. **a.** (i) Explain the roles of the presentation and resource tiers in an EIS.
(ii) Identify which components are typically located in these tiers.

   [20 (5 each part for each tier) marks]

**b.** Explain the benefits of including a business tier in a web application or EIS, compared to performing business functionality in the presentation tier.

   [10 marks]

**c.** Draw a five-tier EIS architecture for the following system: an online travel agency which customers can use once they have registered, to search for flights and to make bookings for flights. The system maintains a database of flights, customers and bookings, and also interacts with external sites for airlines and credit card verification. You only need to consider the functionalities used by customers. For each component in your architecture identify its kind (e.g., controller, entity bean).

   [20 marks]
3. **a.** (i) Explain the purpose of the *Session Facade* pattern for an EIS.

(ii) Identify to which EIS tier this pattern belongs.

[10 (5 each part) marks]

**b.** Give the diagram of the typical architecture for the Session Facade pattern.

[15 marks]

![Diagram of EIS architecture](image)

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**c.** Consider the case of the system shown in Figure 1. Here, presentation tier components *P1*, *P2* and *P3* all use entity beans *E1* and *E2*, and component *P4* uses entity beans *E2* and *E3*.

(i) Explain how this system can be improved by the use of Session Facade.

(ii) Show the revised architecture after its application.

[25 (15 + 10) marks]
4. a. (i) Explain what a web service is.
   (ii) Identify two general properties which a function should have in order to be suitable to be made available as a web service.
   
   [10 (5 each part) marks]

b. Explain (i) the purpose and elements of the Router and Broker web service patterns.
   (ii) Give the diagrams of their typical structures.
   
   [20 (10 each part) marks]

c. A service used by an online coffee retailer to fulfil customer orders operates as follows: the service first requests cost and time estimates for an order of the requested quantity of a make of coffee from a number of different suppliers. If there are suppliers able to supply the order within the customer deadline, then the order is confirmed with the supplier giving the lowest quote. Otherwise, the supplier promising the fastest delivery is chosen.

Define a web service architecture for this service, using appropriate web service patterns.

[20 marks]