# Birkbeck

(University of London)

BSc/FD EXAMINATION

Department of Computer Science and Information Systems

## Information Systems Management (COIY019H5)

CREDIT VALUE: 15 credits

Date of examination: 3rd of June, 2016
Duration of paper: 2 hours (2:30pm to 4:30pm)

There are **six** questions on this paper.

Answer only **four** of the six questions.

Each question carries **25** marks in total. Questions indicate marks for sub-questions.

If more than four questions are attempted, only marks from the best four questions will be reported as your examination mark.

No extra materials are required or allowed.

 

1. Development process

(a) Describe the *Extreme Programming* approach, describing its underlying principles and its activities. (**18** marks)

Reuse

(b) Illustrate the SELECT Perspective approach (Allen & Frost, 1998) to reuse. In particular, explain the three workflows proposed by (Apperly et al., 2003) in their updated version of the SELECT Perspective approach. *Note: You do not need to detail the three workflows; a short description of the meaning of each of them is sufficient.* (**7** marks)

 

2. Project Management

Consider the PERT diagram showing the tasks of a project, depicted in Figure 1; tasks are indicated as arc labels ($T_1, \ldots, T_9$), and the duration is indicated in weeks ($T_1, 6$ meaning that $T_1$ has duration 6 weeks).

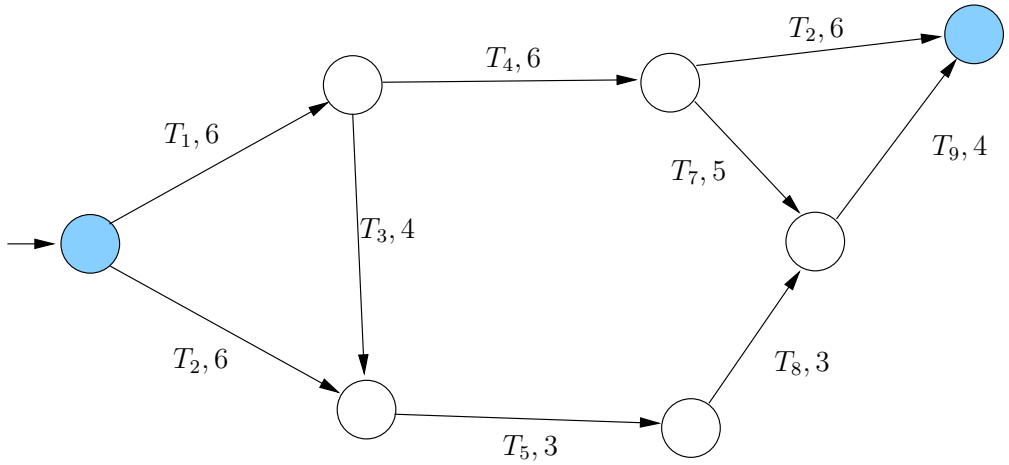


Figure 1: PERT diagram for Question 2.

(a) Identify the critical path(s) and give its (their) duration. (**3** marks)

(b) Give the earliest start time and the latest start time for $T_4$, $T_3$ and $T_8$. (**10** marks)

(c) Suppose that, due to changes in the available resources, the execution of $T_6$ has actually taken 2 weeks instead of 4. Is the total duration of the project affected? If it is, how? (**3** marks)

(d) Suppose that the execution of $T_8$ has actually taken 6 weeks instead of 3. How is the total duration of the project affected? (**3** marks)

(e) A manager has the resources to reduce the time allocated to one task (*any* task but only one) by 2 weeks. Find what task the manager should choose in order to achieve the maximum reduction of the total duration of the project. Justify your answer. (**6** marks)

*Note: In the sub-questions (d) and (e), assume that the change occurs starting from the initial situation and not after the changes considered in previous sub-questions.*

 

3. Design patterns

(a) Discuss the issues surrounding the use of the *State* pattern. (**14** marks)

(b) Consider the diagrams in Figure 2, which depict a class representing ski instructors. Instructors have a level of proficiency which goes from 1 to 3. The fee charged for a one-hour lesson by an instructor depends on the level; those at level 1 charge the basic fee; those at level 2 charge the basic fee plus 20%; those at level 2 charge the basic fee plus 35%. Notice that the attribute baseFee is static. The operation getLessonFee() is therefore specified as follows (in pseudo-code).

```
if level == 1
then return baseFee;
else if level == 2
     then return baseFee*1.2;
     else return baseFee*1.35;
     endif
endif
```

Apply the State pattern to the class Instructor so that the operation getLessonFee() does not need to rely on the conditional statements above. Briefly explain the use of *polymorphism* in your application of the State pattern. (**11** marks)

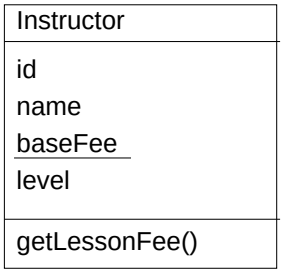


Figure 2: Diagram for Questions 3(b).

 

4. Data management

(a) Explain the use of a database broker framework in persistent data management. In particular, describe the use of two levels of generalisation among broker classes. (**15** marks)

(b) Explain the use of the *Proxy* pattern in data management design, and why *caches* can be used with such a pattern. (**10** marks)

 

5. System design and architecture

(a) Illustrate the *layering* approach to the division of a system into subsystems. In particular, discuss the *three-layer* and the *four-layer* architectures as special cases of layering. (**15** marks)

(b) Discuss whether a layered architecture can improve portability. (**4** marks)

(c) Explain how dividing a system into subsystem helps to maximise reuse at component level. (**6** marks)

 

6. Detailed design

(a) Discuss the notion of *coupling* in the context of structured design. (**10** marks)

(b) Discuss the issues surrounding the Liskov Substitution Principle. (**5** marks)

(c) Consider the class diagram in Figure 3 modelling train tickets. Notice that, in the diagram, train tickets can be *season tickets*, in which case they have an expiration date and a type (monthly, weekly etc.). Notice that not all tickets are seasons tickets. There are also *staff tickets* that are issued to members of staff, whose number and category are represented in the attributes staffNo and staffCategory respectively. Explain what kind of coupling the diagram lacks. Suggest a change to improve cohesion in this design. (**10** marks)

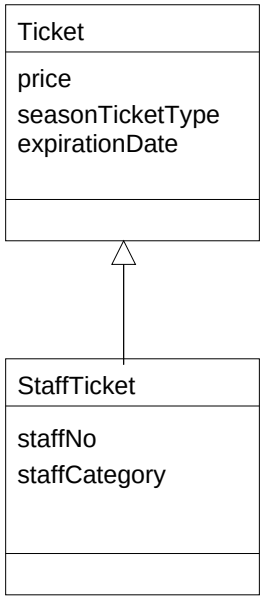


Figure 3: Diagram for Question 6(c).

 