THE BRITISH COMPUTER SOCIETY

THE BCS PROFESSIONAL EXAMINATIONS
BCS Level 5 Diploma in IT

SYSTEMS DESIGN

6th May 2008, 10.00 a.m.-12.00 p.m.
Answer FOUR questions out of SIX. All questions carry equal marks.
Time: TWO hours

*The marks given in brackets are **indicative** of the weight given to each part of the question.*

Calculators are **NOT** ALLOWED in this examination.

1.

a) The table below is taken from a University staff resourcing system. Normalise the table to produce a set of relations in Third Normal Form. You must show all of your working.

(16 marks)

Course Code	Course Description	Tutor Code	Tutor Name	Room Number	Room Tel. Number	Hours per week
BABC	BA Business Computing	1276	Sue Smith	317A	2771	7
		1283	Mark Liddle	317A	2771	7
		1237	Moira Jones	229	2755	3
BSCNC	BSc Network Computing	1276	Sue Smith	317A	2771	3
		1283	Mark Liddle	317A	2771	4
		1237	Moira Jones	229	2755	1
		1765	Dave Brown	317A	2771	6
BSCCOMP	BSc Computing	1276	Sue Smith	317A	2771	3
		1283	Mark Liddle	317A	2771	3
		1237	Moira Jones	229	2755	8
		3256	Mary Kent	217	3633	10

b) The seven relations below are all in Third Normal Form and have been produced by normalisation. Construct an entity relationship diagram from these relations. You do not need to show optionality or relationship names.

(9 marks)

COURSE

Course Code
Course Title

COURSE/MODULE LINK

Course Code
Module Code

MODULE

Module Code
Module Title
Tutor Code

TUTOR

Tutor Code
Tutor Name
Tel. No.

TUTOR GROUP

(Module Code)
(Tutor Group Number)
No. of students
Room Number

ROOM

Room Number
Building Code

BUILDING

Building Code
Building Name

2.

a) Explain how each of the following UML techniques is used in the design of an object-oriented system. Illustrate your answers with an example:

i) statechart or state diagrams

(6 marks)

ii) use cases

(6 marks)

iii) sequence diagrams

(6 marks)

b) Discuss how the three techniques in part (a) relate to each other.

(7 marks)

3.

a) Explain the following object-oriented concepts:

i) inheritance

(4 marks)

ii) polymorphism

(4 marks)

iii) aggregation

(4 marks)

b) A company operates a complex set of benefits for its employees. The employees are either sales employees, who earn a basic salary plus 20% commission, or non-sales employees who earn a salary only. However, sales employees' salaries are calculated using a different algorithm to non-sales employees.

Managers are either sales managers or non-sales managers and all managers earn additional money from a profit share scheme.

The sales managers also earn a group commission of 3% on each sales employee's sales in the sales manager's group. The salary of all managers is calculated using the same algorithm as non-sales employees.

A sales manager may also make individual sales and accrue standard sales employee's commission.

All types of employee share several attributes, but also have attributes of their own. The following operations (possibly with multiple methods) are used for the various employees:

```
salaryCalc();
profitShare();
commission();
groupcommission();
```

Draw a class diagram, using the above operations and the necessary inheritances, which shows how the pay will be calculated for the following staff:

a non-sales employee
a sales employee
a non-sales manager;
a sales manager

There is no need to identify any attributes or introduce any new operations. Any assumptions you make must be stated and justified.

(13 marks)

4. Write short notes on each of the following web page components, stating the relevance of each in systems design.

a) Web Page Frames
b) Cascading Style Sheets (CSS)
c) Java Beans
d) Cookies
e) JPEG images

(5 x 5 marks)

5. An application with a large number of windows can be difficult for a user to navigate.

a) Describe five different ways in which a user of a multi-window computer system might be taken to a new window.

(5 x 2 marks)

b) Briefly explain some of the issues to be considered when designing the navigation between windows in a multi-window application, considering how you can make the process easier for the user.

(15 marks)

6. Small shops are increasingly using PC based EPOS (Electronic Point of Sale) tills, which can be difficult for sales staff with limited IT experience. Explain some of the advantages and disadvantages of each of the following input devices, as part of an EPOS till system.

- Touch Screen
- Keyboard
- Barcode Scanner
- Mouse

(4 x 5 marks)

Briefly discuss how an EPOS system design might need to change for the till to be used by customers as a self-service till.

(5 marks)