THE BRITISH COMPUTER SOCIETY

THE BCS PROFESSIONAL EXAMINATION
Certificate

INFORMATION SYSTEMS

18th April 2002, 10.00 a.m.-12.00 p.m.
Time: 2 hours

SECTION A

Answer TWO questions out of FOUR. All questions carry equal marks.

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

1. A *Theatre Agency* supplies tickets to shows at several theatres and cinemas in an area. Their clients can be individuals or groups of people from clubs and societies. Discounts are provided for groups over 10. Regular clients are given discounts if they book more than 6 performances per year. The company advertises in local and national papers, on local radio and on the web. Bookings can be made either by visits to the office, by telephone or on the web. Payment is made by cash, credit card or cheque. Regular clients, whether individual or group, are given one month's credit so details of their accounts need to be kept to ensure payment is made on time.

a) You are employed by a local software company to provide small business solutions. Describe the stages, tasks and techniques you would use to analyse the above scenario and design a computerised solution. **(12 marks)**

b) Using the above as examples, draft a series of data flow diagrams depicting the physical flow of data and its processes. Provide a key of the symbols you use within these diagrams. **(9 marks)**

c) Identify the important entities, named relationships between them and example attributes for each entity. Indicate probable primary and foreign keys. **(9 marks)**

2. *a)* Compare and contrast the facilities offered by the following software tools, using examples with which you are familiar:

i) CASE tools and Project Management Software **(5 marks)**
ii) Expert Systems and Management Information Systems **(5 marks)**
iii) A Data Dictionary and a Database **(5 marks)**

b) Describe and give examples of the theory and concept of the following:

i) An object **(5 marks)**
ii) A class **(5 marks)**
iii) A method **(5 marks)**

3. *a)* You have been asked to supervise a trainee analyst to help produce a feasibility study. What is a feasibility study? What should it contain? What fact-finding techniques can be used? **(15 marks)**

b) Give two examples of costing methods that can be used to show that savings can be made by implementing a system. **(6 marks)**

b) Briefly describe the roles of:
i) a Database Administrator (DBA) **(3 marks)**
ii) a Network Administrator **(3 marks)**
iii) a Systems Analyst **(3 marks)**

[Turn over

4. *a)* The manager of a book and CD/record shop wishes to expand her business onto the Internet. She has heard the term 'E-Business' and 'E-Commerce'. Draft a memo explaining these terms and give her advice on how the Internet could be used to increase her business and provide a competitive advantage. **(6 marks)**

b) What techniques would you use to design a user-friendly web site? **(8 marks)**

c) Draft two story boards/screens that you could use to show the effectiveness of a web site. **(8 marks)**

d) What security issues would you advise her to take? **(8 marks)**

SECTION B

Answer FIVE questions out of EIGHT. All questions carry equal marks.

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

5. Explain the differences between each pair of terms given in the table (Figure 1) below:

Pair	Relational Database Term	Computer Programming Term
Pair 1	Domain	Program Variable
Pair 2	Relation	Data File
Pair 3	Recordset	Record
Pair 4	Stored Procedure	Procedure

Figure 1: Pairs of terms **(12 marks)**

6. Write short notes on THREE of the following technologies explaining how they are used in the development of a distributed information system.

i) Active X control
ii) FTP server
iii) CGI script
iv) Active Server Page
v) HTML form

Indicate whether the technology runs on the client, on the server, or on both. **(12 marks)**

7. *a)* Assume the data in Figure 2 below represents a badly designed database table. Identify each of the following concepts:

i) An attribute which is an identifier but is NOT the primary key
ii) A 'One to Many' Relationship
iii) A Null value **(6 marks)**

b) Explain why the presence of each of the above concepts in part *a)*, indicates that Figure 2 represents a badly designed database table. **(6 marks)**

CustomerID	OrderID	OrderDate	ItemID	ItemDescription	CustomerName
3	3	23-Dec-01	2	5cm Bolt	CJ James
3	5	23-Jan-02	2		CJ James
5	6	23-Jan-02	2		MK Patel
5	6	23-Jan-02	4	Washer	MK Patel
5	7	24-Jan-02	4		MK Patel

Figure 2: **A Badly Designed Database Table**

8. A hotel company owns a chain of approximately 50 hotels throughout a country. Currently each hotel has its own booking system which records room bookings made by customers on a spreadsheet. Bookings are entered into a particular cell (see Figure 3) and contains the guest's name and an address code.

The Managing Director for the hotel company needs to be convinced that the current booking system, described above, is inefficient in terms of staff costs and information processing.

Draft a brief non-technical report to the Managing Director outlining the benefits that a web-based booking system could offer over the existing system.

DATE	Room no 1	Room no 2	Room no 3	Room no 4	…	Room no 25
1/09/01	Whittle, YO12 7DE		Lyons, HU9 7GT	Piro, DL9 7HC		Goodison, HU9 8BD
2/09/01	Mann, HU1 6TY	Mistry, NE3 9WS	Lyons, HU9 7GT			
3/09/01	Petty, YO3 9HB	Mistry, NE3 9WS				
4/09/01	Petty, YO3 9HB	Mistry, NE3 9WS				Kuma, TS9 7TY
……	……	……	……..	……..	…	……
30/09/01		Shandri, TS8 6YJ				

Figure 3: Example spreadsheet for bookings made for an hotel during September

(12 marks)

9. Describe, with the aid of examples, the distinctive principles and the motivations behind THREE of the following diagramming techniques used in the design of an information system:

i) Rich Pictures
ii) Class Diagram
iii) Use Case model
iv) Semantic Net **(12 marks)**

10. Design a user interface for the following scenario:

A University has a music CD collection that is available for members to borrow. Existing University employees qualify as members, but they must register and pay an annual fee before they can become a member. Three members are designated as 'superusers'; they are responsible for the operation of an information system that supports the following tasks:

- *Organise and maintain a database that stores information about each CD held in the collection*
- *Maintain a list of members and record their membership details such as name, email address and start date of membership*
- *Process the Loan and Return of CDs*
- *Send reminders by mail for overdue loans and when membership is due to expire.*

Assume the following:
- *One of the 'superusers' has the role of ' librarian' and can issue loans and process returns*
- *Members can borrow up to 3 CDs at any time*
- *The period of a loan is 21 days, after this time the loan is recorded as being overdue*
- *The information system is operated on a single-user basis using a PC workstation.*

Your design should include:
- A diagram showing a menu structure for your user interface.
- A series of sketches showing the interaction between the librarian and your user interface. **(12 marks)**

11. A college runs a number of courses that can be studied part-time. Students enrol on a course and can take an assessment at the end of a course. Given below are a series of transactions and constraints that relate to an application that stores enrolment and assessment data. The constraints are used to maintain the data integrity of the application. Assume there are three courses that run on different days over a period of 12 weeks. The courses have run in the past and this may be reflected or implied in the transactions.

a) Express the transactions as a collection of records in a data file such that the data is consistent with the given constraints. Include any additional records necessary to maintain the data integrity of the application. Show your working out and state any assumptions you have made. **(8 marks)**

c) Choose a constraint and outline how you would enforce the data validation required for that constraint. **(4 marks)**

TRANSACTIONS :

T1: Create a course identified by a unique code 'JDP'.
T2: Enrol a student called John Brown to course 'JDP'
T3: Enrol a student called Bob Wright to course 'EJB'
T4: Enrol a student called John Brown to course 'JDP'
T5: Enrol a student called John Brown to course 'JDB'
T6: Assessment for John Brown awarded Grade = 'PASS'
T7: Enrol a student called Alex Brown to course 'JDP'
T8: Create a course identified by a unique code 'JDB'.
T9: Create a course identified by a unique code 'JDP'.
T10: Enrol a student called Joe Smith to course 'JDP'
T11: Enrol a student called John King to course 'JDB'
T12: Enrol a student called John Brown to course 'EJB'
T13: Assessment for Alex Brown awarded Grade = 'PASS'
T14: Assessment for John Brown awarded Grade = 'FAIL'

CONSTRAINTS :

C1: Three courses, identified by codes 'JDP', 'JDB' and 'EJB', are the only valid courses.
C2: 'JDP' is the course that must be studied before studying either course 'JDC' or 'EJB'.
C3: A student can enrol on no more than two courses at a time and can re-take a course at any time in the future if that course runs in the future.
C4: At the end of each course an assessment grade (either ABSENT, PASS or FAIL) must be recorded for each student. A student who elects not to undertake an assessment is given the grade 'ABSENT'.

12. Describe how the techniques known as CONCURRENCY CONTROL and RECOVERY work together to ensure that the integrity of the data is maintained in the following situation:

The data held in an on-line order processing system may be subject to users issuing many transactions that require access to the same data item. For instance, when an item is purchased, the effect of the data processed by one person may cause the data read by another person to become inconsistent. **(12 marks)**