**The British Computer Society**
1 Sanford Street
Swindon, Wiltshire
United Kingdom
SN1 1HJ

Tel: +44 (0)1793 417424
Fax: +44 (0)1793 480270
E-mail: bcshq@hq.bcs.org.uk

# THE BRITISH COMPUTER SOCIETY

THE BCS PROFESSIONAL EXAMINATION
Diploma

## SYSTEMS DESIGN

20th April 2000 - 2:30p.m. - 4:30p.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.*

**1.** *a)* Describe the object-oriented approach to systems development. **(18 marks)**

*b)* State the main differences between this and traditional approaches. **(7 marks)**

**2.** Consider the following scenario:

A building firm carries out various jobs for customers. A customer may be a company or a private individual. The building firm records the name and address for each customer. For companies, it also records a list of contact names together with their department and telephone numbers. For private individuals, the firm records a daytime and evening telephone number.

The firm records a description, start-date, and estimated duration for each job. A job consists of various items of work. Each item of work has a description, a labour cost in man-hours and a list of materials together with quantities required and prices.

The firm needs a database system to record this information. The database system should be able to carry out various functions including the following:

- Produce a bill of materials for a particular job
- Calculate the overall cost of a particular job
- Add and delete contact names for a company customer
- List items of work and jobs that use a particular material.

Using a notation with which you are familiar, create a class diagram (including attributes and operations) that represents the above scenario. **(25 marks)**

**3.** *a)* Describe what is meant by the following two terms:

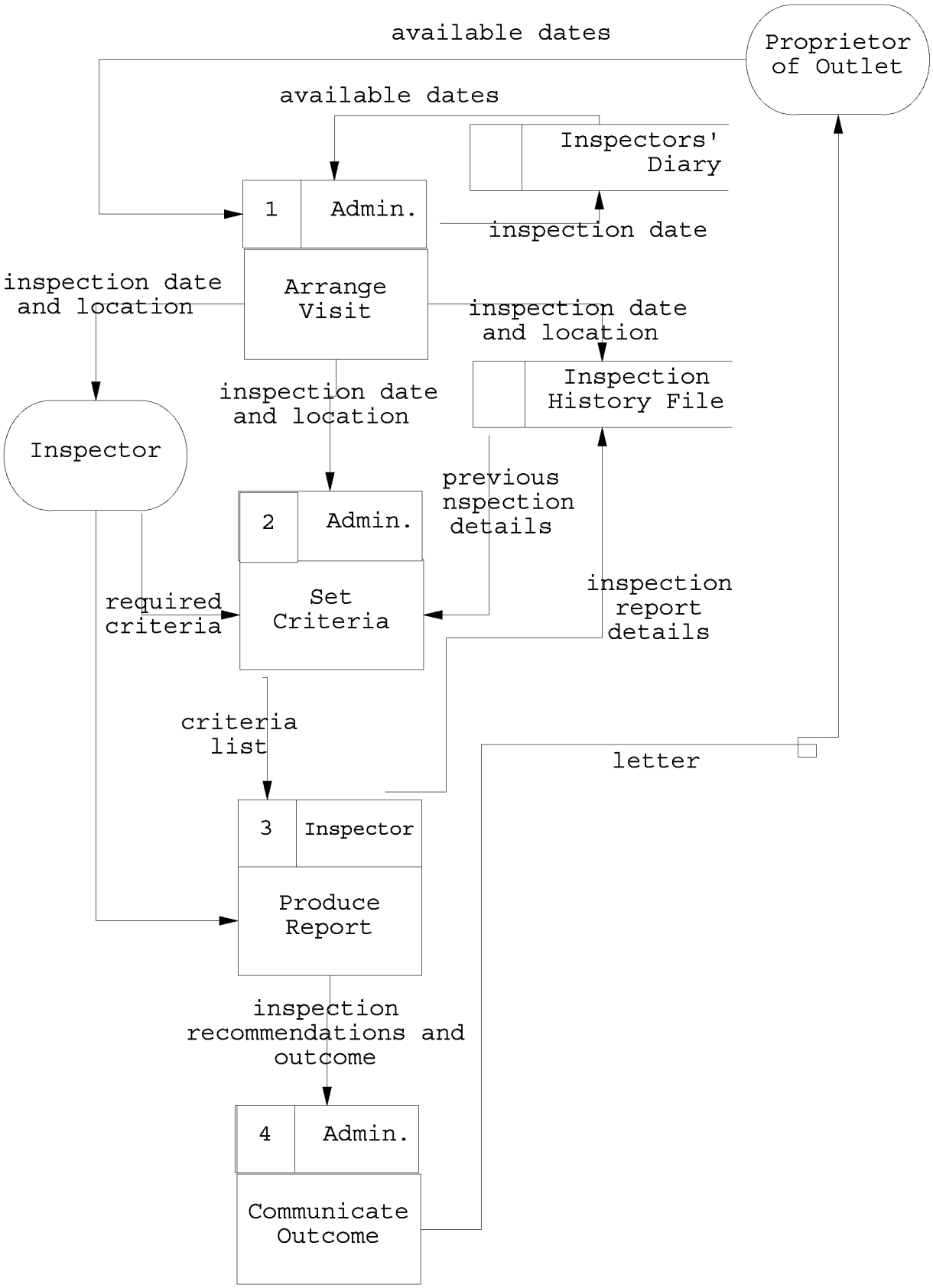
*i)* Transform analysis;
*ii)* Transaction analysis. **(7 marks)**

*b)* Consider the outline dataflow diagram on the next page which represents an inspection process for food outlets. The process runs as follows:

The local authority administration team arranges a date for the inspection visit by consulting the inspectors' diary and consulting with the proprietor of the food outlet. The inspection date and location is communicated to an inspector. The administration team draw up a list of criteria for the inspection based on any previous visit of the outlet and the advice of the inspector. The inspector carries out the visit and produces a report which contains recommendations and an outcome. The recommendations and outcome are then communicated through the administration team to the proprietor of the outlet.

Convert the dataflow diagram (on the next page) into a structure chart showing control flags, flows as couplings, and module groupings. **(18 marks)**

**[Turn over**


available dates
Proprietor of Outlet
available dates
Inspectors' Diary
1
Admin.
inspection date
inspection date and location
Arrange Visit
inspection date and location
inspection date and location
Inspection History File
Inspector
previous nspection details
2
Admin.
required criteria
Set Criteria
inspection report details
criteria list
letter
3
Inspector
Produce Report
inspection recommendations and outcome
4
Admin.
Communicate Outcome

**4.** An automobile dealership is preparing to transfer its customer sales ordering system from one that requires transcription from a clerical form to one with direct input from an on-screen form.

The main details required are order number, type of car, model, customer details, and up to six optional extras per car. The costs of the car and the options are totalled to give total cost to the customer. Insurance can be provided at special rates to customers. Insurance costs, however, always relate to the age of the driver.

Each car is supplied with a two-year parts and labour warranty

The present clerical form follows:

**ABC Motors**
**New Vehicle Order Form**

| | | | | |
|---|---|---|---|---|
| **Order No** | | | | |
| **Customer Details**<br>**Name**<br>**Address**<br>**Tel No.** | | | | |
| **Model** | | | | |
| **Engine Size** (tick) | 1.6 litres | 1.8 litres | 2.0 litres | 2.5 litres |
| **Basic Cost** | | | | |
| | | | | |
| **Colour**<br>(Select from dealer list) | | | | |

Options
(Select from dealer list)

| **Option Name** | **Cost** | |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |

**Registration Number.**

Insurance Option
(first named driver is assumed to be the vehicle owner unless otherwise stated)
(ALL drivers are assumed to be resident at the owner's address)

| **Driver** | **Date of Birth** | **Convictions, etc.** | **Loading** | | |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | **Insurance Total** | |
| | | | | **Cost Total** | |
| | | | | **VAT** | |
| | | | | **Customer Total** | |

*a)* Identify the reasons for undertaking a normalisation process. **(5 marks)**

*b)* Normalise to the third normal form, showing all stages, the attributes (shown in bold face) for this un-normalised order form. Provide a full explanation of your decisions, details of any checks carried out during the process and identify any key fields. **(15 marks)**

*c)* Suggest the major problems likely to be encountered during the implementation of such a form when using a modern Fourth Generation Language (4GL), taking into account that the screen form layout must simulate the clerical document as closely as possible. **(5 marks)**

**5.** Application development tools and methods have become more important as software development costs increase.

Write short notes identifying the roles of the following in application generation:

*a)* Java **(5 marks)**
*b)* SQL **(5 marks)**
*c)* HTML **(5 marks)**
*d)* C++ **(5 marks)**
*e)* XML **(5 marks)**

**6.** *a)* Describe the role of Entity Life History diagrams in systems design and discuss how they feed into the development of a system. Evaluate the contribution Entity Life Histories (ELH) can make to the design and implementation of a system. **(13 marks)**

*b)* Produce an Entity Life History chart for the new car entity (in the automobile dealership in Question 4), from the details given below, justifying the details and events included. **(12 marks)**

When a new car is purchased it must first be insured and then taxed, before the customer can complete the transaction. Insurance can be provided by the car dealership or privately by the customer.

The car must be regularly maintained to comply with the conditions of the warranty. Service intervals are 10,000 miles or 12 months, whichever comes first. During the first two years of ownership, servicing is free.

Most of the components of the car are repaired free under warranty, but there are a few which the customer must pay for.

When the customer sells the car, he may decide to part-exchange it for a new car, or sell it privately.