THE BRITISH COMPUTER SOCIETY

THE BCS PROFESSIONAL EXAMINATION
Diploma

SYSTEMS DESIGN

25th April 2002, 2.30 p.m.-4.30 p.m.
Answer FOUR questions out of SIX. All questions carry equal marks.
Time: TWO hours.

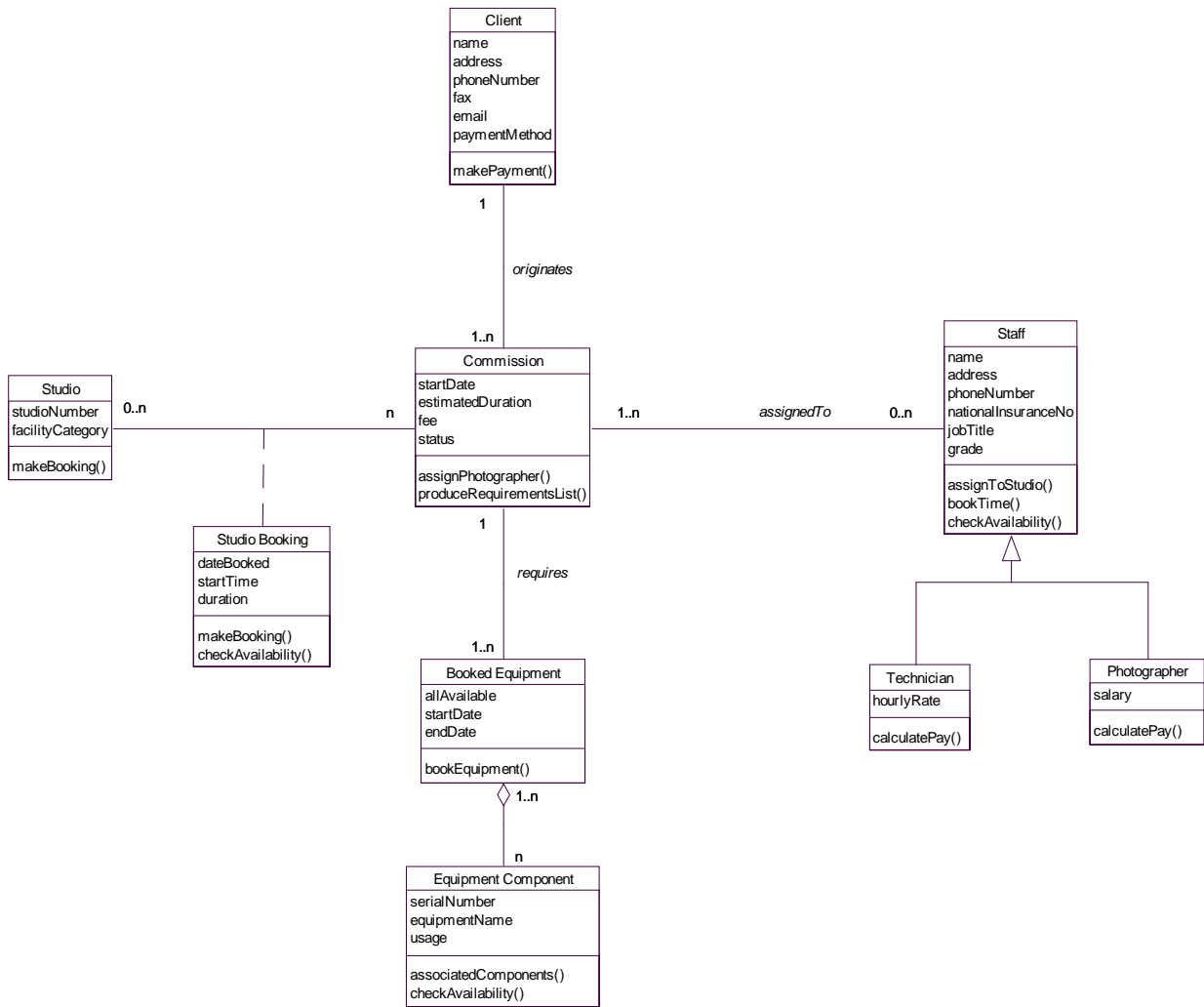*The marks given in brackets are **indicative** of the weight given to each part of the question.*

1.   *a)*   Outline how modern screen-form design techniques can be used to provide interactive validation of data entered by keyboard or other means, and to minimise the time-consuming entry of keyed data.   **(4 marks)**

   b)   An order entry system is based on the clerical document shown below:

Customer No.				Order No.	
Customer Name					
Customer Address					
Prod.No.	Product Description	Unit Price	Qty		Line Total
			Order Total		
			TAX		
			Total Order Cost		

   i)   Explain the types of data entry validation needed for the fields in the above form.

   ii)   State which fields would have data keyed in, and which would show as retrieved data dependent on other keyed fields.

   iii)   Identify which key fields would need to be linked in order for the screen form to be used satisfactorily by operators to view orders from different customers.   **(15 marks)**

   c)   Name and outline the content of the database tables from which the screen form would be derived.
   (6 marks)

2.   *a)*   Describe, with supporting examples, the components of a fourth generation language (4GL) and how they combine to form an effective prototyping tool.   **(10 marks)**

   b)   Discuss possible limitations, when prototyping with such tools in order to design systems, and explain how you would attempt to minimise any difficulties.   **(15 marks)**

3. Identify and briefly describe the main features you would expect to find in the following:

    a)   Web page generators   **(5 marks)**

    b)   HTML pages   **(5 marks)**

    c)   Virus detection/scanning software   **(5 marks)**

    d)   File server   **(5 marks)**

    e)   Firewall software   **(5 marks)**

4.   *a)*   With reference to the design of software architecture, draw an annotated diagram and briefly explain its role for each of the following Unified Modelling Language (UML) models:

        i)   package diagram
        ii)   deployment diagram   **(10 marks)**

   b)   For each of the following UML models, explain which aspects of systems design are being modelled:

        i)   class diagram
        ii)   statechart (state diagram)
        iii) sequence diagram   **(9 marks)**

   c)   Sequence diagrams and collaboration diagrams are both used to model object interaction. Briefly outline the different approach each of these diagrams uses to achieve this.   **(6 marks)**

5. The following diagram is a fragment from a class diagram for a photographic agency system. It is to be mapped to a Relational Database Management System (RDBMS).

Client
name
address
phoneNumber
fax
email
paymentMethod
makePayment()

1

originates

1..n

Commission
startDate
estimatedDuration
fee
status
assignPhotographer()
produceRequirementsList()

Studio
studioNumber
facilityCategory
makeBooking()

0..n   n   1..n   *assignedTo*   0..n

Staff
name
address
phoneNumber
nationalInsuranceNo
jobTitle
grade
assignToStudio()
bookTime()
checkAvailability()

Studio Booking
dateBooked
startTime
duration
makeBooking()
checkAvailability()

1

requires

1..n

Booked Equipment
allAvailable
startDate
endDate
bookEquipment()

1..n

n

Equipment Component
serialNumber
equipmentName
usage
associatedComponents()
checkAvailability()

Technician
hourlyRate
calculatePay()

Photographer
salary
calculatePay()

a) Briefly explain how each of the following elements of the class diagram may be mapped:

   i) class
   ii) one to many association
   iii) many to many association
   iv) association (link) class
   v) aggregation   **(10 marks)**

b) Describe three strategies that may be used to implement the 'Staff' inheritance hierarchy when undertaking this mapping. **(6 marks)**

c) Produce a suitable relational schema (set of normalised tables) for the above class diagram. **(9 marks)**

6. The following Data Flow Diagram (DFD) models part of the business processes of an accommodation agency that offers a service to landlords by finding them suitable tenants.
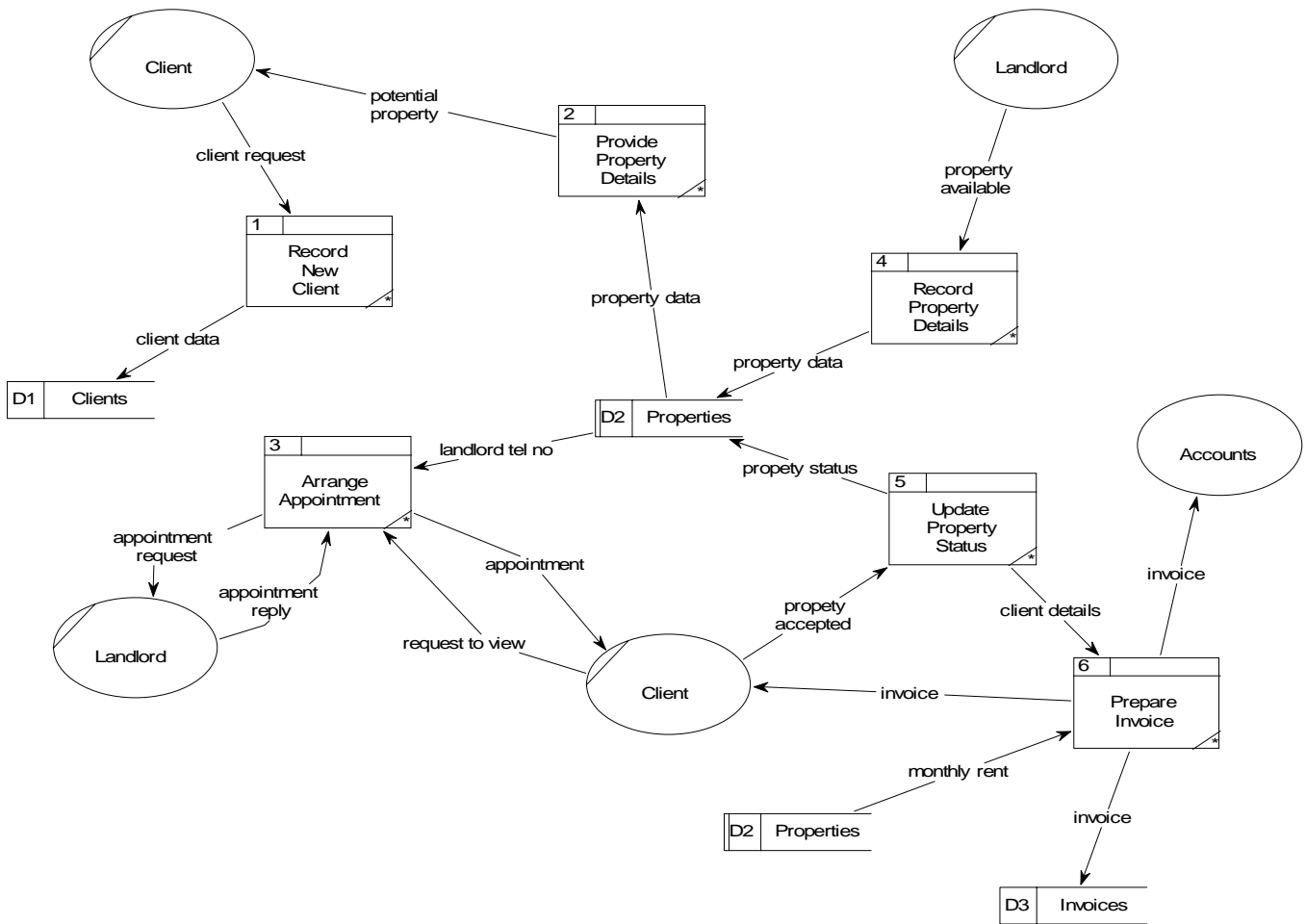
a)   With reference to transform analysis and transaction analysis, discuss the main principles of how a structure chart may be constructed from the information contained in a data flow diagram.   **(12 marks)**

b)   Produce a structure chart from the given DFD.

(13 marks)