

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

For Examiner's Use

General Certificate of Education
January 2007
Advanced Level Examination



COMPUTING
Unit 5 Advanced Systems Development

CPT5

Wednesday 24 January 2007 9.00 am to 10.30 am

<p>You will need no other materials. You may use a calculator.</p>

Time allowed: 1 hour 30 minutes

Instructions

- Use blue or black ink or ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- Answer the questions in the spaces provided.
- All working must be shown.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The maximum mark for this paper is 65.
- The marks for questions are shown in brackets.
- The use of brand names in your answers will **not** gain credit.
- You are reminded of the need for good English and clear presentation in your answers. Quality of Written Communication will be assessed in all answers.

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Question	Mark	Question	Mark
1		5	
2		6	
3		7	
4			
Total (Column 1)		→	
Total (Column 2)		→	
TOTAL			
Examiner's Initials			

Answer **all** questions in the spaces provided.

- 1 A college wants to improve the physical security of its open access computers located in several unsupervised rooms. The network security is also causing concern. When a student joins the college, the student is issued with an ID card, which includes a photograph and his/her student ID barcode. The college is proposing to set up a computerised system which will monitor who is in the room at any one time and which computers they are using. The system should prevent any unauthorised person from entering the room. It may be necessary to modify the way in which students' ID cards are made.

The following hardware devices are being considered for use with this system. Justify **one** different possible use for each hardware device in the proposed system.

(a) barcode scanner

.....

.....

(1 mark)

(b) fingerprint scanner

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.....

(1 mark)

(c) digital still camera

.....

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(1 mark)

(d) digital video camera

.....

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(1 mark)

(e) programmable doorlock/turnstile

.....

.....

(1 mark)

(f) RFID (Radio Frequency Identification) tag reader

.....

.....

(1 mark)

2 A payroll program is being designed which will calculate the pay for hourly-paid employees.

A programmer is asked to write a function **CalculateGrossPay (Hours, PayRate)**. The function will take as parameters the number of whole hours an employee has worked in the week and the basic rate of pay of the employee.

The first 35 hours a week are paid at the basic rate of pay.
Hours over 35 are paid at the premium rate of 1.5 times the basic rate of pay.
No employee is paid for more than 48 hours in any week.

Choose **three** suitable sets of test data for the parameter Hours, which between them adequately test the functionality of this function. Justify your choice in each case.

1

.....

.....

2

.....

.....

3

.....

.....

(6 marks)

6

Turn over for the next question

3 The network manager of a college has to ensure that all software on college computers is installed legally.

(a) Which law is the network manager following?

.....
(1 mark)

Some software is bought with a site licence for use on any number of college computers whereas other software is bought with a multi-user licence for installation on a specified number of college computers. The network manager wants to set up a relational database to keep details of software licences and which college computers have which software installed. She has identified the following details she wants to store about each software package:

- Software name
- Version
- Software ID (ten alphanumeric characters), unique
- Supplier
- Date purchased
- Expiry date
- Number of computers licenced

When any software is installed on a college computer, she wants to store the following details:

- Computer ID of the computer on which the software is to be installed (six alphanumeric characters)
- Date of software installation
- Staff ID who requested the software (3 letters) for this computer

(b) The two entities **SoftwareLicence** and **SoftwareInstallation** have been identified.

Draw an Entity-Relationship diagram for the above entities.

(3 marks)

(c) Complete the following Data Definition Language (DDL) statements to create the fully normalised tables necessary to implement the database, including all key fields.

(i) CREATE TABLE SoftwareLicence

(.....)

)
 (3 marks)

(ii) CREATE TABLE SoftwareInstallation

(.....)

)
 (4 marks)

(d) The network manager wants a list of each computer and what software is installed on it. Using the SQL commands SELECT, FROM, WHERE, ORDER BY and any others that you consider appropriate, write an SQL statement to query the database tables for a list of computers with software name and version installed.

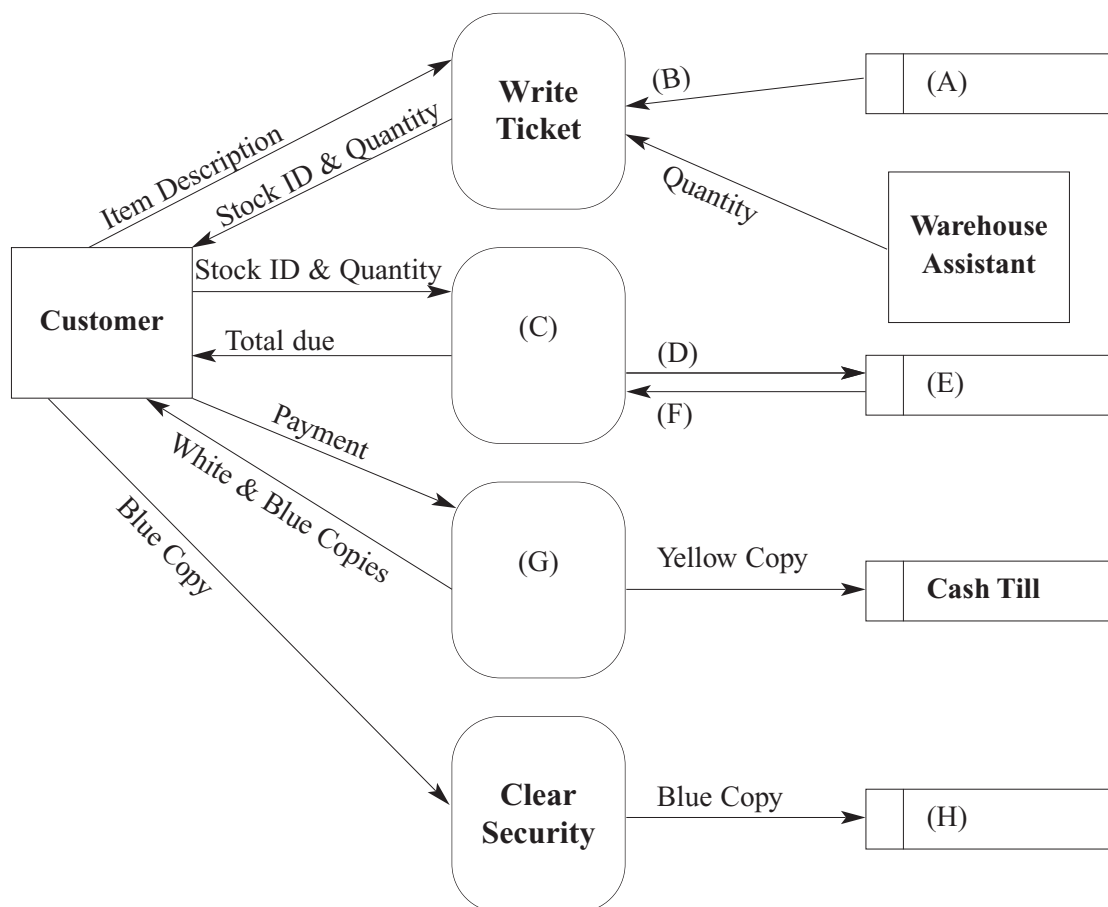
.....

)
 (4 marks)

4 A large builders' merchant uses the following system for its stock control.

- The customer chooses the item required
- The warehouse assistant looks up the **Stock ID** in a **catalogue** and checks the quantity
- The warehouse assistant writes out a ticket with the Stock ID and quantity of the item
- The customer takes this ticket to the cash desk to pay
- The cash desk operator uses the **Stock ID** to look up the **unit price** from a **price list** to **calculate the total due**
- The cash desk operator **produces the receipt** in triplicate (one white top copy and a blue and a yellow carbon copy)
- The cash desk operator puts the yellow copy of the receipt into the till for cashing up at the end of the day
- The customer gets the other two copies of the receipt
- The customer goes to collect the merchandise
- At the gate the customer gives the blue copy of the receipt to the security guard, who puts the receipt into a **re-order file** for re-ordering stock.

Figure 1



(a) Complete the diagram shown in **Figure 1**.

A

B

C

D

E

F

G

H

(8 marks)

(b) What type of diagram is this?

.....

(1 mark)

(c) What type of printer is required to print the receipt as described?

.....

(1 mark)

Turn over for the next question

5 E-mail may be more easily intercepted and altered than paper mail without the knowledge of either the sender or the recipient.

In symmetric encryption, the same key is used to encrypt and decrypt a message. In asymmetric encryption, one key is used to encrypt a message and another key is used to decrypt the message.

(a) Why is symmetric encryption not used for encrypting e-mail messages?

.....
.....
(1 mark)

(b) In asymmetric encryption, one key is made publicly available (the public key) and the other key is kept secret by its owner (the private key).
Jack and Jill want to communicate with each other confidentially, and they each have a private and a public key.

(i) Which key should Jack use to encrypt a message to send to Jill, which only Jill can read?

.....
(1 mark)

(ii) Which key can Jill use to decrypt the message sent by Jack?

.....
(1 mark)

(c) A digital signature authenticates the message, that is, it verifies that the message came from the given sender and that it has not been tampered with.

(i) How is a digital signature produced?

.....
.....
.....
.....
(3 marks)

(ii) If Jack digitally signs the message sent to Jill, how can Jill verify Jack's digital signature?

.....

.....

.....

.....

.....

.....

.....

(4 marks)

10

Turn over for the next question

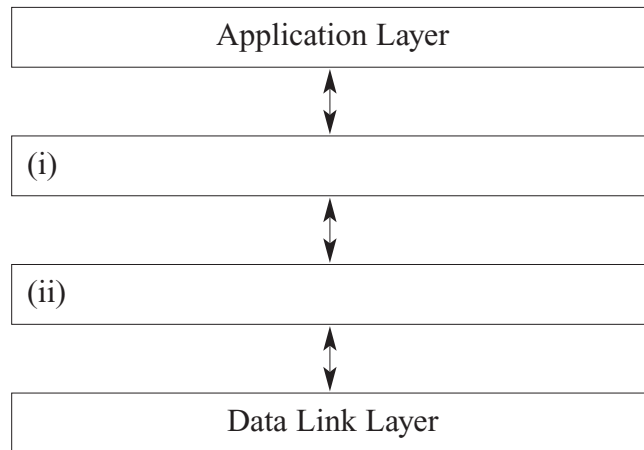
6 A school Local Area Network (LAN) uses the TCP/IP protocol to communicate between computers.

(a) What is a protocol?

.....
.....

(1 mark)

(b) Complete the diagram of the TCP/IP protocol stack below:



(1 mark)

(1 mark)

(iii) Give **one** example of a type of application found in the Application Layer.

.....
(1 mark)

(c) This LAN uses the Ethernet protocol as its Data Link Layer, which uses Ethernet MAC (Media Access Control) addressing to route Ethernet frames. What is an Ethernet MAC address?

.....
(1 mark)

(d) The school now wants to connect to the Internet. Every computer in the LAN is given an IP address with a network ID of 192.168.4 and a subnet mask of 255.255.255.0.

(i) Give **one** example of an IP address for this LAN.

.....
(1 mark)

(ii) How many different host IDs are there?

.....
(1 mark)

(iii) What could the school do if it needs more host IDs?

.....
.....
(1 mark)

(iv) IP addresses starting with 192.168 are private addresses. Why were private addresses chosen for the individual computers on the network?

.....
.....
(1 mark)

(e) The school registers the IP address 222.125.105.15 with the Internet registrar. How can this IP address be used to connect to the Internet?

.....
.....
.....
(2 marks)

Turn over for the next question

7 (a) What is an Expert System?

.....
.....
(1 mark)

(b) Give **one** typical application of an expert system.

.....
(1 mark)

(c) Give the **three** constituent parts of an expert system.

1
.....
2
.....
3
.....
(3 marks)

(d) Users of expert systems claim that they are much more useful than a very large database. Give **two** reasons to justify this claim.

1
.....
2
.....
(2 marks)

7

END OF QUESTIONS