HWA CHONG INSTITUTION
C2 PRELIMINARY EXAMINATION 2012

COMPUTING
Higher 2

20 September 2012 **Paper 2 (9754 / 02)** **1300 -- 1530 hrs**

Answer ***ALL*** questions.
Begin ***EACH QUESTION*** on a ***FRESH SHEET*** of paper.

The maximum mark for this paper is 100.

1. Testing and Implementation are phases of the Systems Development Life Cycle.

   Explain what is meant by

   (a) White box testing [2]

   (b) Black box testing [2]

   (c) When all the modules have been successfully tested, explain 2 other tests that the programmer could use. [4]

   (d) After development and testing of a new software application, there are various implementation methods. Discuss 4 different methods of implementation. [8]

2. A signed simple real number can be defined as follows:

   <signed simple real> ::= + <simple real> | - <simple real>
   <simple real> ::= <integer>.<integer>
   <integer> ::= <digit> | <digit><integer>
   <digit> ::= 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9

   (a) Write an algorithm which takes a string as input and tests the validity of the string representing the new definition of amount. You may assume that the string has no leading spaces or blanks and that it is terminated with a NULL character. [8]

   (b) Write new BNF rule(s) to redefine <simple real> such that it cannot begin with a zero unless it's the only digit before the point. This means 0.33 is valid while 0025.33 and 00.33 are not valid. You may include new definitions in your answers. [4]

   (c) Draw the syntax diagram for the new definition of <signed simple real>. [5]

3. A company manages subscriptions to thirty different magazines. Customers can subscribe to receive one or more of the magazines.

- Each magazine has a category such as Gardening or Current Affairs.
- Each magazine has a subscription rate, which is the cost of subscribing to receive the magazine for 12 months.

Details of the subscriptions are to be stored in a flat file.

Magazine(MagazineID, MagazineName, Category, SubscriptionRate, CustomerID, StartDate, EndDate, CustomerName, Address, Postcode, TelephoneNumber)

(a) Explain what is meant by flat file. Name one advantage of using a database over a flat file. [2]

(b) What are some of the problems with the flat file implementation for subscriptions? [3]

(c) Improved on the flat file and determine the relations needed in the database for the above. Explain the purpose of each relation. [6]

(d) In what way is your Database better than the flat file. [3]

(e) Draw the Entity-Relationship diagram between the relations you have in (c). Explain your answer. [6]

4. (a) What is the role of router in a network? [1]

(b) State the difference between a switch and a router? [1]

(c) State how the following is used and why are they important in a network:

(i) Domain Name server
(ii) Proxy server [4]

(d) Computers connected to the Internet use the TCP/IP suite of protocols for data transmission.

(i) What is a protocol? [1]
(ii) Name **1** layer in the TCP/IP protocol stack. Describe **two** functions of the layer that you have named. [3]

5. A computer system consists of different elements and they all served a particular purpose and function:

There are different types of memories in a computer. They can be broadly categorized into Cache, Primary and Secondary storage.

(a) Explain the purpose of a Secondary storage. Give one example of a secondary storage. [2]

(b) State 3 distinguishing factors across the different types of memories. [3]

Over the last few years we see the introduction of new devices that redefine the way we communicate with computer systems.

(c) Suggest 1 such device that has such an impact and why. [2]

(d) Briefly explain the input/output method of the device in (c) and how is it different from the traditional methods. [3]

6. A shop owner allows credit facility to his customers if they satisfy any one of the following conditions:

- Holding the present job for more than 3 years and residing in the same place for more than 5 years.
- Monthly salary exceeds $1500 and holding the present job for more than 3 years.
- Residing in the same place for more than 5 years and monthly salary exceeds $1500.

The facility is rejected for all other customers.

(a) Create a decision table showing all possible outcomes and results.

(b) Simplify your decision table by removing redundancies. [7]

7. A linked list Abstract Data Type (ADT) has the following operations defined:

- create ( ) -- creates an empty linked list;
- insert (item, p) -- insert new value, *item*, into linked list so that it is at position *p* in the linked list;
- delete (p) -- delete the item at position *p* in the linked list;
- read (p) -- returns the item at position *p* in the linked list;
- length ( ) -- returns the number of items in the linked list;

The linked list is implemented by the use of a collection of nodes that have two parts**:** the item data and a pointer to the next item in the list. In addition there is a *Start* pointer which points to the first item in the list.

(a) (i) Draw diagrams to show the two different situations that can arise when the 'insert' operation specified above is implemented. [2]

(ii) Write an algorithm that could be used to implement the 'insert' operation. [4]

(iii) Write an algorithm that could be used to implement the 'length' operation. [4]

(b) A list, **testList**, is created and the following operations are carried out:

testList.insert (ben, 1)
testList.insert (jerry, 1)
testList.insert (harry, 1)

(i) Draw a diagram to show the state of the linked list after the above operations have been carried out. [2]

(ii) Write the instructions that would delete the last item of **testList** after further insert operations have been carried out. [2]

(c) Show how to implement the following operations for a queue ADT, called **qList**, using the list ADT operations:

(i) add item to queue;

(ii) delete item from queue. [4]

(d) State **two** advantages of using ADTs in program development. [2]

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