UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Advanced Level

COMPUTING **9691/03**

Paper 3 Written   **For Examination from 2011**
SPECIMEN MARK SCHEME

   **2 hours**

MAXIMUM MARK: 90

This document consists of **5** printed pages and **1** blank page.

[Turn over

1 -Safety
        -Testing acceptable parameters in an industrial reaction
        -The effects of a test that passed safety limits in real life may put lives in danger
    -Impossibility
        -Training astronauts to work on the surface of Mars
        -Such a task is not possible in real life because we have not been to other planets
    -Time
        -Testing what will be the outcome of breeding a plant for 100 generations
        -100 generations will, in reality, take 100 years to test
    -Isolation from external factors
        -Growing crystals to study behaviour
        -Too easy for material to be contaminated in real life
    (1 per -, max 3 types, max 9)   [9]

2   (a)
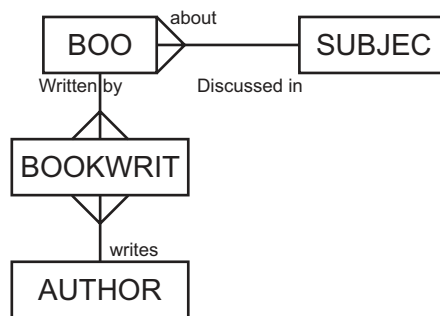
        Mark points:
        1 for a link entity
        1 for other three entities
        3 for three relationships (1 for a many to many if link is not provided)
        2 for pairs of relationship descriptions   [7]

    (b) (i)   -A unique identifier of a record
               -ISBN code of book   [2]

         (ii) -A key other than the primary key used to identify records
               -Book publisher   [2]

         (iii) -A primary key in one table that is used as a link to another table
               -SubjectID in book table   [2]
               (Note: Other suitable examples will be credited)

3   (a) -Whole program not written…
         -so may not compile
         -Testing needs to be done…
         -diagnostics will be more complete
         -Individual segments can be run…
         -allowing errors to be isolated
         -Running will be necessary after very minor changes…
         -continual compilation of whole code is very wasteful/time consuming
         (1 per -, max 5)   [5]

(b) -Check on grammar of statements
-Error diagnostics are issued
-Jump destinations checked for existence
-Control constructs checked
-Check that variables have been declared
-Check for existence of library modules
(1 per -, max 3) [3]

4   **(i)** -Short piece of user friendly code to…
-stand for the operation in a low level language instruction
-Used to make program code more easy to remember
-In this case ADD replaces a binary code
(1 per -, max 3) [3]

    (ii) -Address of data is stored…
-in the address pointed to in the instruction [2]

    (iii) -Address is added to the contents of…
-the Index Register (IR) to give the data address [2]

    (iv)   1 0 1 1 1 0 0 0
(Carries)   1   1 1 1 1 1
(1 for each nibble + 1 for carries) [3]

5   **(a)**
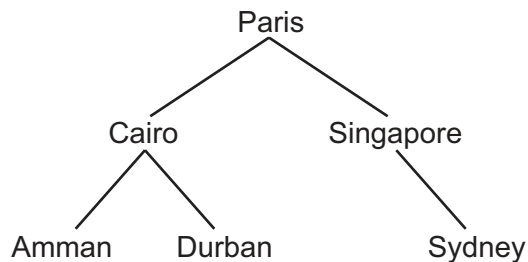
    (1 per subtree) [2]

(b) Inorder traversal
-Traverse left hand subtree using inorder traversal
-Visit root node
-Traverse right hand subtree using inorder traversal
(1 per point or equivalent thereof) [3]

(c) Insert Paris   Paris
Compare Cairo and insert   Cairo, Paris
Compare Singapore and insert   Cairo, Paris, Singapore
Compare Durban and insert   Cairo, Durban, Paris, Singapore
Compare Amman and insert   Amman, Cairo, Durban, Paris, Singapore
Compare Sydney and insert   Amman, Cairo, Durban, Paris, Singapore, Sydney
(1 per row, max 6, max 3 if either half of explanation (actions and example) is missing) [6]

6   **(i)**   -Memory/file is divided into regular sized areas
         -Divisions are done on a physical basis
         -Jobs or files are allocated a number of pages according to size
         -Pages may be discontiguous
         -Indexes of pages/files kept
         -Address can be calculated by adding page address to raw address

    (ii)   -Memory/file is divided into variable length blocks called partitions or segments
         -Divisions are done on a logical basis
         -Jobs or files can consist of many segments
         -Segments usually match the natural divide in the jobs
         -Index of segments stored which must store base address and length of each segment

    (iii) -A whole job does not need to be resident in memory at the same time
         -When a new page is required it is loaded into memory over a redundant page
         -from a reserved area of the hard drive
         -A record of location is stored in an index
         -User believes whole job is in memory at once
         -Use of cache memory
         -Mention of disk threshing

         (1 per -, max 9. Note: the above points represented diagrammatically should be credited))   **[9]**

7   **(a) (i)**   -Data can only be accessed by the methods provided by the class
         -e.g. Name can only be accessed from the class Employee
         -Technical details of the methods and properties are hidden within the object   **[2]**

    (ii)   -When one class is a subclass of another it can use its methods and attributes
         -e.g.Salesperson can use Getname() from Employee   **[2]**

  (b) (i)   -Removes ambiguity from algebraic expressions
         -No brackets required
         -Allows for processing using stacks
         (1 per -, max 2)   **[2]**

    (ii)   (a+b)/(c-d)
         (1 for each bracket and 1 for / sign)   **[3]**

    (iii)   a2bc+*/
         (1 for bc+, 1 for bc+ within 2 *, 1 for 2bc+* within a /)   **[3]**

8   **(a)** -Data collected about present conditions to…
         -include windspeed/humidity/temperature/pressure/…
         -Also conditions close to required location...
         -used to affect forecast for required area
         -Predictions made are compared with actual results…
         -in order to hone the predictions for next time
         -Data collected by weather balloons/satellites/ground stations/…
         (1 per -, max 4)   **[4]**

  (b) -Designed to allow any machine instruction to execute simultaneously…
         -on a number of data locations/array
         -Weather forecasting involves the manipulation of large volumes of data…

-using same calculations…
-if done simultaneously the process is speeded up which is important as the forecast is time critical
(1 per -, max 4) [4]

9 Note that examples are given and that any sensible use from the scenario will earn credit.

(i) -Short distances/good conductor/mention of coaxial or twisted pair
-Used for connecting accounts department computers as they will be on desks and hence cabling is permanent [2]

(ii) -Allows movement of system around so that user can stay connected to LAN without physical restriction/subject to interception of data
-Used for connecting computers in warehouses so that they can be moved to area of working [2]

(iii) -Switch with information about computers on network
-Used to connect each LAN to internet [2]

(iv) -Links two LANs/Limits access between the LANs
-Links the accounts and warehouse LANs while ensuring that confidential accounts details do not become available in the warehouse [2]

(v) -Alters signal to a form that is suitable for computer/communication medium
-Used to allow manager separate internet connection via a telephone line [2]

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