MARK SCHEME for the May/June 2011 question paper

for the guidance of teachers

9691 COMPUTING

9691/33   Paper 3 (Written Paper), maximum raw mark 90

1 (i) -More than one processor
-to perform a single job
-Each processor is used to perform a task which is a part of the entire problem [2]

(ii) -an additional processor which works alongside the main processor
-Processor capable of processing large representations/many bytes // uses large size registers
-Particularly used for floating point calculations [2]

(iii) -Allows a single instruction to be carried out…
-simultaneously on a number of data locations // processor has several ALUs
-Used to process all the values in an array at the same time [2]

2 (a) (i) -Used to combine already compiled procedures…
-to produce an executable file
-Deals with external references from the main program to other (pre-compiled) modules

(ii) -Copies object code/executable code into…
-primary memory ready for execution
-Deals with addressing anomalies/re-locatable addresses
(1 per -, max 4) [4]

(b) (i) -Address in instruction is the address of the address of the location...
-which contains the data/instruction to be used
-Allows complete change in program by changing indirect address to point to a different subroutine // allows greater range of memory to be addressed/by example [3]

(ii) -Address in the instruction is added to
-the contents of the IR...
-which can then be incremented to allow access to a sequence of locations// Allows the contents of an array to be accessed sequentially by successive instructions // used to access a contiguous block of memory [3]

3   -Coaxial cable
        -description/one transmission medium (copper) surrounded by insulation

     -Twisted pair (twisted cable)
        -description/two conducting wires twisted around each other

     -Optic fibre
        -many fibres contained
        -description/fine glass strands carry light signals // optic fibre is very fragile
        -Interference free

     -Wireless communication
        -Radio signals
        -open to interception / latency / uses WEP keys for security

     -Infrared/Microwave
        -restricted by line of sight

     -transfer rate statement
     -range statement

Max 4 marks for a list of media

     (1 per -, max 8)   [8]

4 **(a)** -the processing must be fast enough so that each output can affect the next output
        -The system must react fast enough to satisfy customer need
        -otherwise the person wanting to go through will have to wait   [2]

    (b) -Radar sensor (or similar) sends signal to processor…
        -to say that person is within range
        -Processor decides whether door is open
        -If door is open then it remains so
        -If door is shut then processor sends signal to the actuator
        -Actuator opens the door
        -If no signal for (5) seconds then processor shuts door…
        -by using actuator to shut it
        -Need for override capacity in an emergency like a fire
        -Digital to analogue converter

        (1 per -, max 5)   [5]

5 (a) -Part of <u>secondary</u> storage // hard disk…
-allocated to be used as if it were main memory
-Contents must be transferred to main memory to be used but…
-provides high speed input to main memory
-Description of problem of disk thrashing // data continually having to be loaded to and from the main memory

(1 per -, max 2)   [2]

(b) -Main memory is divided into fixed or variable length blocks called segments
-each segment forms a memory partition // each segment is a logical area of memory
-program is loaded into an available partition
-OS must maintain a list of the used-unused segments / what programs occupy what segments
-OS maintains a list of their start address / size
-Available segments are matched to the list of jobs waiting to be scheduled

(Mark points shown on a diagram to be given full credit)
(1 per -, max 5)   [5]

6 (i) -used by the database designer/DBA
-a file/table of metadata // description of the data
-table / query / report descriptions
-Identifiers/data type
-validation rules
-data about the database design/logical schema // the E-R model / relationships
(1 per -, max 2)   [2]

(ii) -designed to allow a user to query/retrieve data/sort the database
-insert / delete / update
-data in the database / table(s)
*Accept by example, e.g. SELECT * FROM…. (max 1 mark)*   [3]

7 (a) 1010 0001
(1 per nibble)   [2]

(b) $\overline{10001011}$
$\overline{11 \quad 1}$

(1 for answer, 1 for carries)

OR full two marks for correct answer

OR 1 only for the correct right hand side i.e. 1011   [2]

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8. (a) (i) -A dynamic data structure changes size according to the contents which need to be stored

-A static data structure has the same size irrespective of the amount of data needing to be stored. [2]

(ii) -linked list can be of any size, only limited by the size of memory // An array is of a fixed size // array may result in wasted space

-Stack is read from and written to at the same end which will be the head of list [2]

(b) (i)

```
                    FRO
                  /      \
               BEV        TSI
              /          /     \
           AMB        ROS       WIL
                     /
                  JAM
```

left subtree   1
right subtree   1
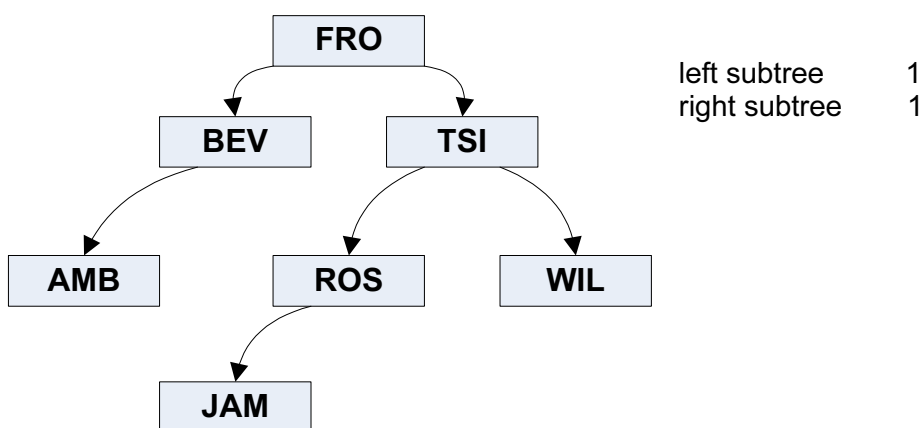
(ii)
```
INPUT NewValue
REPEAT
IF NewValue < Root
    THEN
        'Follow Left Subtree'
    ELSE
        'Follow Right Subtree'
        Root = Leaf
ENDIF
UNTIL 'No Leaf'
INSERT NewValue at Leaf
END
```

Mark as follows:
-input of new value
-Loop
-with correct condition
-if less than the root value move to left subtree
-if greater than the root value move to left subtree
-When no further items to consider, the new value is inserted as a new leaf

Score 0 if the answer does not read as an 'algorithm'
(1 per -, max 4) [4]

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(iii) -The value at the node is not only data, it is part of the structure of the tree
-If the node is simply deleted then the subtree leading from it is not navigable // or by example

-the algorithm to delete a leaf node is straightforward // deleting a leaf node does not change the structure of the tree

To remove the value from the tree either:
-it remains in the tree structure and…
-Mark value as deleted so that it cannot be output…
-so that it can act as the root for its subtree
Or:
-The entire subtree without its root is read to a list
-The subtree is deleted
-The values in the list are read back into the tree (as for adding new values) // or by example
(1 per -, max 4)   [4]

9 (a) -can be processed directly by reading the expression from left to right
-is free of ambiguities
-does not require brackets
-does not require rules of precedence
-can be processed using a stack
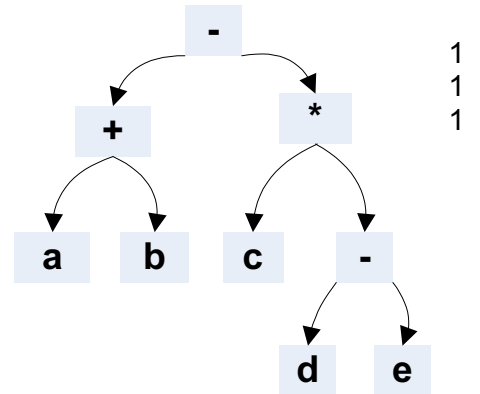(1 per -, max 2)   [2]

(b) (i) *Mark as follows...*
–sign at the root   1
Correct left subtree   1
Correct right subtree   1

(ii) a b + c d e - * -

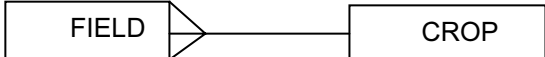*Mark as follows...*
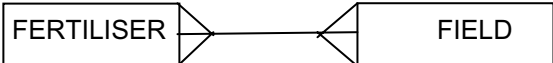a b +   (at the start of the expression)
c d e - *
Minus sign at the RHS of expression
(1 per -, max 6)   [6]

10 (i) Many to one   FIELD ▷— CROP   [2]

(ii) Many to many   FERTILISER ▷—◁ FIELD   [2]

(iii) -Link table needed...
-with primary key made up of combination of primary keys of FERTILISER and FIELD
-Primary keys of FERTILISER and FIELD used as foreign keys in link table
-This turns the many to many relationship into// a many-to-many relationship can not be implemented
-One-to-many and many-to-one/ 2x one-to-many new relationships
(1 per -, max 4)   [4]

11 (a) -Interpreter translates one instruction, runs it before going on to the next // Compiler translates all the instructions before run.
-Compiler creates object code/Interpreter does not
-Interpreter will translate code in loops more than once/Compiler only once
-Interpreter makes for easier debugging/Compiler allows faster execution <u>translated</u> code
-Interpreter must be present to run the program // compiler not needed at runtime
(1 per -, max 3)   [3]

(b) -When content is copied to the MAR at the start of the cycle…
-the contents of the PC is incremented
-If the instruction decoded by the CIR is a jump instruction
-the address in the instruction register is copied to the PC   [4]

12 *Components...*
-Bridge to connect the two LANs
-Router to connect to the communication line to the WAN/Internet
-Switch to act as a hub at the centre of the star network if either LAN uses that type of topology
-Gateway to provide access to the Internet
-Firewall to safeguard the network against unauthorised access from outside
-Modem converts analogue signals to digital // allows communications from the outside using telephone wires
(for all the above some justification must be given ...)

Communication media...
-mention of any particular cable type - UTP/Twisted pair/Fibre optic/Coaxial 1 mark

-*description/usage for particular cable type for 2nd mark. Including...*
-Low level of traffic may point to UTP or twisted pair
-Length of cable points away from coaxial
-cables can be used because business is on one site
-the length of cabling must be considered

-Fibre optic is high speed/secure/interference free
-Use of wireless media allowing physically unrestricted access across site.
(1 per -, max 6)   [6]