

**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

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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- 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
- (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]

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- 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]

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5 (a) -Part of secondary 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)
$$\begin{array}{r} \underline{10001011} \\ 11 \quad 1 \end{array}$$

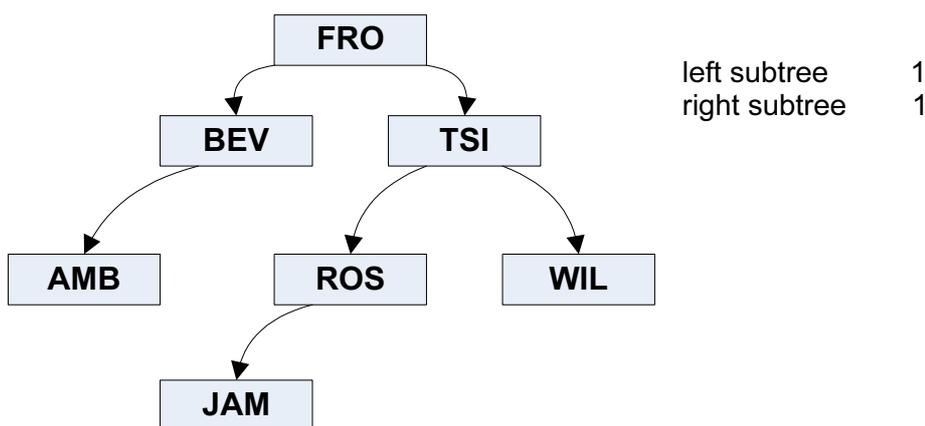
(1 for answer, 1 for carries)

OR full two marks for correct answer

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

8. (a) (i) -A dynamic data structure changes size according to the contents which are stored
 -A static data structure has the same size irrespective of the amount of data needed to be stored.
- (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)



(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
 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]

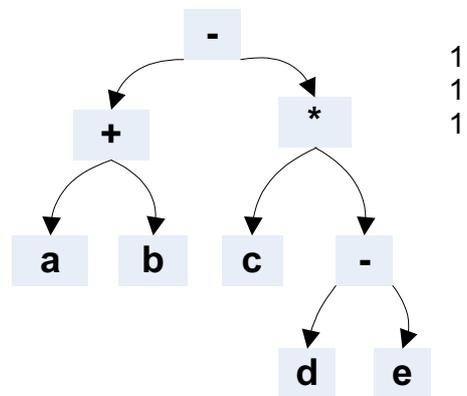
9 (a) -can be processed directly by reading the expression from left to right

- 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
- Correct left subtree
- Correct right subtree



1
1
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]

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- (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 translated 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]