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MARKSCHEME

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COMPUTER SCIENCE

Higher Level

Paper 1

13 pages

SECTION A

1. 11001010 ***[1 mark]***

2. (a) ***[1 mark]*** *for the following, or similar definition:*
- a tree is a hierarchical data structure
- each child node
- is below a parent
- a node which has child nodes below is parent node

(b) ***[1 mark]*** *for any of the following* ***[max 2 marks]****:*
- to search for files in a logical order
- directory as parent node
- sub directories as child nodes
- until list addresses of files found

3. ***[1 mark]*** *for any of the following* ***[max 2 marks]****:*
- carries data, instructions and addresses
- between CU, ALU and main memory
- to fetch and execute instructions

[1 mark] *for any of the following* ***[max 2 marks]****. Overall* ***[max 3 marks]****:*
- max processing speed needed
- parallel carries all bits at the same time
- serial would mean one bit at a time so too slow
- immediate access needed

4. ***[max of 2 marks]*** *for advantage and* ***[2 marks]*** *for disadvantage* ***[1 mark]*** *for valid point and* ***[1 mark]*** *for description or justification.*

Advantages
- no need to go to the doctor for trivial illnesses which saves time and money
- can be quickly reassured that illness not important
- doctor does not waste time with trivial complaints
- early warning of symptoms that could lead to serious illness
- some people feel too shy to explain their symptoms to a person and feel more secure with a computer.

Disadvantages
- medical expertise not easily transferred to program
- patients may not realise all the symptoms
- many illnesses need personal reassurance
- not a good way to find out that you may have a serious illness
- mistakes in input could have serious consequences in either direction

5. **Circular**

[1 mark] *for any of the following* ***[max 2 marks]****:*

- confines the list to a predefined area in store
- problems if queue becomes greater than given space
- only two pointers needed but each time item is added have to ensure front and end do not coincide
- and check for wrap around each time an item added or taken
- in the case of wrap around calculation of pointer takes time
- items do not have to be moved

Linear

[1 mark] *for any of the following* ***[max 2 marks]****:*

- if not moved up each time an item taken a lot of storage space is wasted
- very quick to add items as pointers quickly adjusted
- if list moved up when item taken then both pointers have to be adjusted and moving every item in a long list takes time

Allow any valid point on each structure / algorithm to implement the structure.

6. ***[2 marks]*** *for each feature.* ***[1 mark]*** *for identifying and* ***[1 mark]*** *for explanation:*

- rotational delay (latency) disk rotating to appropriate sector
- seek time as heads move to appropriate cylinder
- transfer time to send data from disk to main memory

7. (a) ***[max 2 marks]*** *with one for each of the following points:*
MHz refers to frequency ***[1 mark]***
of fetch execute cycles ***[1 mark]*** per second
in this case 750 mega ***[1 mark]*** or binary million ***[1 mark]*** cycles per second

(b) personal computer or workstation or portable ***[1 mark]***

8. ***[1 mark]*** *for:*
OS / applications need more memory

[1 mark] *for reason why:*
use of more complex GUIs, spread of multi-tasking *etc.*

9. ***[1 mark]*** *for each valid point up to* ***[max 2 marks]****:*

Systems analysis

- system needs to change over time ***[1 mark]***
- to incorporate new features ***[1 mark]***
- update system in light of how it has performed ***[1 mark]***

Code preparation

[1 mark] *for each valid point up to* ***[max 2 marks]****:*

- new sections of code may have to be written ***[1 mark]***
- some may need amending in the light of changing circumstances ***[1 mark]***
- for example new fields in records ***[1 mark]***
- space for more records in a file ***[1 mark]***

10. ***[1 mark]*** *for each valid point* ***[max 2 marks]****:*

- sending computer sends message "ready to send"
- receiving computer sends message "ready to receive"
- handshake established and first computer sends

11. ***[1 mark]*** *for each valid point* ***[max 2 marks]****:*

- allows one object to be derived from another
- the derived object has all the data members and functions of the original
- plus any extra that are defined within it

12. ***[1 mark]*** *for each valid point* ***[max 3 marks]****:*

- cost of installing hardware and software for new system
- configuration of possible systems/details of proposed new system
- description of effects of new system on production and workers
- cost benefit analysis

SECTION B

13. (a) *Award **[1 mark]** for each correct line and **[1 mark]** for output:*

LEFT	RIGHT	POS	**output**
1	6	3	
4	6	5	
4	5	4	item found

[total 4 marks]

(b) There are various possibilities.
Allocate:
[1 mark] initialise a counting variable `Z <= 1`
[1 mark] note position where found `POS <= POSITION`

[2 marks] for looking to right *(allow **[1 mark]** for attempt)*
e.g.

```
Z <-- 1
POS = POSITION
while VALUE (POS) = VALUE (POS + 1)
      Z = Z + 1
      POS = POS + 1
endwhile
```

[1 mark] for also going left
[1 mark] for terminating with:

```
until LEFT > RIGHT or Z = 0
```

[6 marks]

14.

a	b	c	lights
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	0
1	1	1	0

[1 mark] *for each 2 rows correct. e.g. 5 rows correct gets* ***[2 marks]*** ***[max 4 marks]***

(b) ***[2 marks]*** *for the following expression:*

`(not a.b.not c) + (not a.b.c) + (a.not b.not c) + (a.not b.c)`

[1 mark] *if no more than one term is incorrectly transferred from the truth table.*

Allow ***[2 marks]*** *for follow through if truth table is incorrect but expression is correctly derived from the truth table.* ***[max 2 marks]***

(c) By Karnaugh map

	c	not c
not a.not b		
not a.b	1	1
a.b		
a.not b	1	1

`(not a.b) OR (a.not b)`

from first and second terms: `not a b(c OR not c) = not a b`
from third and fourth terms: `a not b(not c OR c) = a not b`

Final expression simplifies to a `XOR b`

[4 marks] for `a XOR b`; ***[3 marks]*** for `(not a b) OR (a not b).`
Allow follow through ***[max 4 marks]***.

15. (a) ***[1 mark]*** *for each of the following* ***[max 2 marks]*** *:*

- Go to head pointer, compare name,
- if not equal follow next pointer
- repeat until name of artist found.

(b) ***[1 mark]*** for clear start node.
[2 marks] for clear pointers to next two nodes.
[1 mark] for indicating year and artist pointers.

(c) ***[1 mark]*** *for each of the following points* ***[max 4 marks]*** *:*

- stack is used to record the return addresses
- last one added is first returned
- by creating linked list pointing to return address each time subroutine called
- include back pointers
- and traversing in reverse order to return to correct address.

16. (a) (i) *Accept **[1 mark]** for each of the following **[max 3 marks]**:*

- when buffer full an interrupt sent to O/S
- spell checking halted
- necessary location addresses put on stack
- buffer emptied
- information taken off stack and spell checking continues

(ii) *Accept **[1 mark]** for each of the following **[max 3 marks]**:*

- when buffer full data transferred directly to memory
- processor not involved
- spell checking continues unhalted

(b) address bus ***[max 2 marks]***

- address of data needed
- sent from instruction register
- opens appropriate path to memory location

data bus ***[max 2 marks]***

- data copied from memory location
- sent along data bus to accumulator

17. (a) Test data would be generated by some other device ***[1 mark]***
and output checked for correct warning signals ***[1 mark]***
Give ***[1 mark]*** *for making clear that not a real heart used and* ***[1 mark]*** *for output check* ***[max 2 marks]***

(b)

- normal data ***[1 mark]*** that is data within the expected range ***[1 mark]***
- extreme data ***[1 mark]*** that is beyond normal limits ***[1 mark]***
- abnormal data ***[1 mark]*** *e.g.* no signal at all ***[1 mark]*** too high for a real heart ***[1 mark]***
- data at the limits ***[1 mark]*** *i.e.* just inside/outside normal range ***[1 mark]***

[max 2 marks] *for each type of data. Accept only two answers* ***[max 4 marks]***.

(c) ***[2 marks]*** for stating at least 2 different methods of changeover and ***[2 marks]*** for clearly explained implications.

For example

- parallel running ***[1 mark]*** so that if a failure in new system the existing one gives backup ***[1 mark]***
- direct changeover ***[1 mark]*** could be risky with no backup ***[1 mark]***
- phased introduction ***[1 mark]*** gives staff time to get accustomed to new system ***[1 mark]***