



ASSESSMENT and  
QUALIFICATIONS  
ALLIANCE

# Mark scheme

# June 2002

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## GCE

## Computing

## Unit CPT4

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## Processing and Programming Techniques

The following notation is used in this mark scheme

- ; - means a single mark;
- A – means acceptable creditworthy answer;
- R – means reject answer as not creditworthy.

1

Type of <u>problem</u> / system (scientific / commercial / logical...);	Different languages have different strengths / are designed for different types of problem; ( <i>End User might apply</i> )
The <u>data</u> requirements;	There may be special data types or structures relevant to the new process;
The <u>expertise</u> of the programmers;	It would be expensive and inefficient to train or employ new ones / better to use a language the programmers are familiar with;
<u>Platform</u> ;	OS support / CPU capacity / compiler exists / compatibility with existing software;
Any <u>overlaps</u> with the present system;	Modules could be re-used / already written modules would be tested and working properly, thus saving development time;
<b>R</b> 'time constraints'	Unless WELL justified

For each of 3 points, 1 mark for point, 1 for explanation to max:

6

6

2

(a) +3x;

1

(b) 3+x;

1

(c) 3x+;

1

**3**

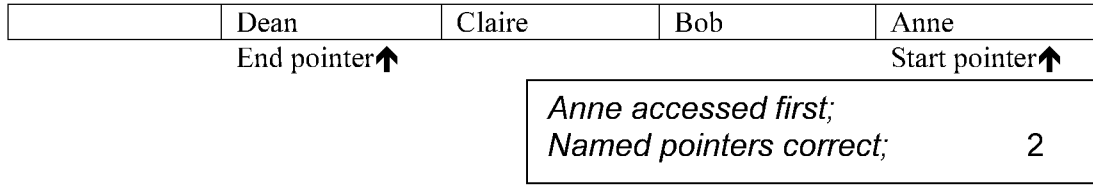
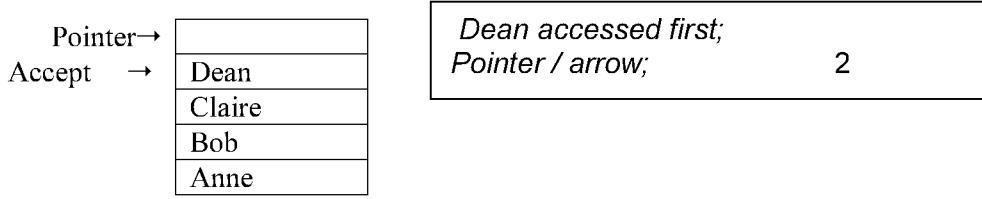
- 3 *A register:*
- (a) A storage unit where data / control information is temporarily stored /  
**A** instructions  
 A storage unit which can be accessed rapidly /  
 A storage unit internal to the processor;  
 A storage unit that can be symbolically identified 1  
**A** location for storage unit  
*Need the idea of storing*
  - (b) Fast access / they have to be accessed frequently / execution faster;  
 Can have their own special instructions;  
 Can have a bigger word size;  
 No bus bottleneck / inter-register transfer along dedicated internal buses;  
 1
  - (c) *Any 3 from*

Accumulator	Holds the results of arithmetical calculations;
MAR	Holds the address for data transfer e.g. read / write;
MDR / MBR	Holds data during transfer (between main memory and the processor);
PC / SCR	Holds the address of the next instruction (to be fetched / executed);
CIR	Holds the current instruction while it is being analysed and executed;
Status / Flag register	Each bit is set or cleared depending on whether a certain condition holds;
Index	For use in index addressing
Interrupt	For vector mapping

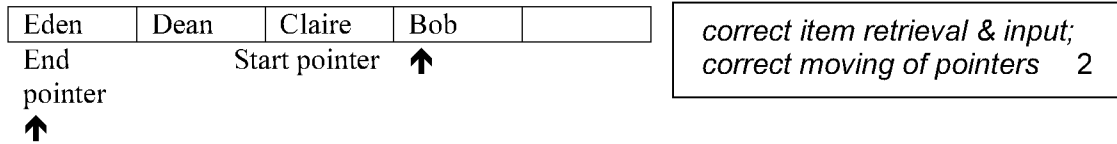
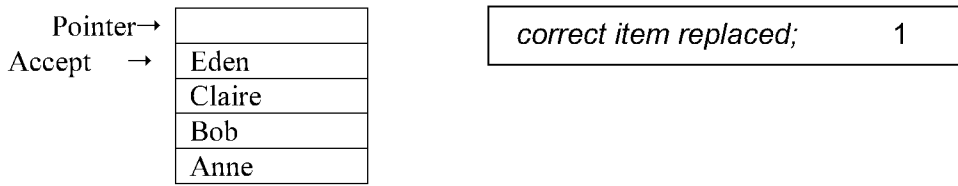
*Must have correct name*  
*No mark for name alone.* 3 5

- 4 (a) 11, 17, 9,21,15,23; 2  
*(2 if all right, 1 if 4 of 6)*  
*If > misinterpreted, follow through for 1 mark*
- (b) A bubble sort; 1
  - (c) To detect when all the numbers have been sorted  
 Efficiency (to stop procedure repeating unnecessarily); 1 4  
**R** to detect when numbers have switched

5 (a)



(b)



- (c) In a linear queue data is static, so queue ‘moves’ through storage/
- In a FIFO structure storage locations are only used once;                      1
- In a circular queue, the locations will be re-used;                      1
- Thus a circular queue has a more efficient use of memory;                      1

*1 mark for each of 2 points*



- 
- 8 (a) (i) Any whole number. There should be no decimal point. 1  
(ii) Any number with a decimal point 1  
(iii)  $1101.11 = 8 + 4 + 1 + \frac{1}{2} + \frac{1}{4}$  1  
 $=13.75 (13 \frac{3}{4})$  1  
*1 mark for complete working, 1 mark for answer*
- (b) B7 3E 1
- (c) To represent the address / contents of a location;  
Error messages;  
In assembly language programs;  
HTML property values;  
It is easier to absorb / understand a large number in hex than as a long sequence of 1s and 0s;  
Easier to write... (if relevant to example) 1 7  
*Other valid examples accepted. Good reason with wrong example not accepted.*  
**R saves space!**
- 
- 9 (a) Processor would have to be re-designed; 1  
every time a new type of device was connected. 1  
OR  
Voltages / signals required for correct operation of device; 1  
different from voltages / signals used by processor. 1  
OR  
So as not to slow the processor down; 1  
To cut down on the number of required ports; 1  
1 device controller can control more than one device of the same type; 1
- (b) *nb 'controller' or 'card' needed*  
Floppy disc  
Hard disc / IDE  
Any serial device - mouse, printer, modem, Joystick  
Any parallel device - printer, CD-ROM, CD-R, DVD, tape unit, zip drive, scanner.  
SCSI - Zip drive, tape unit, CD-ROM, CD-R, DVD  
USB  
I/O controller  
Sound card / MIDI interface card / graphics card  
Network controller card  
*Any one* 1  
**R** keyboard, VDU
- (c) *Any 2 points* 2  
Address only goes (from the processor) to device controllers / main memory;  
Regardless of whether the data is to be read from or written to that location;  
No feedback / acknowledgement;  
Any data transfer goes on data bus;

- (d) *Any 2 @ two each (1 for name, 1 for description)*
- Memory Write: causes data on the data bus to be written to the addressed location  
 Memory Read: causes data from the addressed location to be placed on the data bus / MBR / MDR  
 I/O Write: causes data on the data bus to be output to the addressed I/O port  
 I/O Read: causes data from the addressed I/O port to be placed on the data bus  
 Transfer ACK: indicates that data have been accepted from or placed on the data bus  
 Bus Request: indicates that a component needs to gain control of the system bus  
 Bus Grant: indicates that a requesting component has been granted control of the system bus  
 Interrupt request: indicates that an interrupt is pending / transmission error  
 Interrupt ACK: acknowledges that a pending interrupt has been recognised  
 Clock / Timing: used to synchronise operations  
 Reset: initialises all components. 4 9  
 A combined Memory, I/O, Bus, Interrupt lines with suitable explanation
- 

### 10 A DLL

- (a) Multitasking allows more than one task to run concurrently /apparently simultaneously/  
apparently at the same time; 2  
 A Accept program, process, application
- (b) A library which is linked to application programs when they are loaded;  
 rather than at compile time. 2  
 A run time / execution
- OR
- Routines to carry out common tasks/ Do not stand alone – need to be linked to other programs; 1  
 Concept of ‘Late binding program’ 1
- (c) Same block of library code can be shared between various tasks; 1  
 Frees up memory - only resident when needed;  
 Save programming time – can use already available DLL;  
*Can carry forward / back between (b) and (c)*
- (d) suspended while DLL is loaded  
 runnable when DLL loaded but other processes have CPU  
 running when given CPU again  
*1 point for 3 states in correct order; 1 for each explanation to max:* 4 9