

GCE 2005
January Series



Mark Scheme

Computing Specification

CPT4 Processing and Programming Techniques

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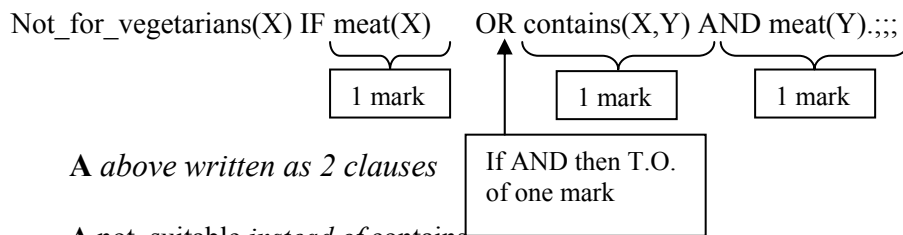
Computing: Unit CPT4

The following notation is used in the mark scheme

- ; - means a single mark;
- / - means alternative response;
- A – means acceptable creditworthy answer;
- R – means reject answer as not creditworthy;
- I – means ignore.

I punctuation i.e. accept without . (fullstop)
 Penalise once in each of (a), (b), (c), (d) for wrong case
 (must be lower case for predicates and atoms, and variables must be capitalised)

1. (a) (i) contains(raitha, yoghurt).; 1
- (ii) dairy product(yoghurt).; 1
- (b) nuts;eggs; **I** any punctuation or 'and' **I** order 2
- (c) not_suitable(X,eggs).;; one mark for not_suitable(X,),
 one mark for 'eggs' in correct place
A contains (X,eggs);;marking as above
A not_suitable(X,eggs) IF contains (X, eggs); give one mark only, as not a goal but a rule
T.O. if anything else added to correct answer **I**? 2
- (d)



A above written as 2 clauses

A not_suitable instead of contains 3

I case for AND. AND can be represented by a comma

R contains (X,meat) **R** contains (Meat,X)

accept any variable for Y but must be the same variable in both cases.
 If not do not give mark for meat(Y).

Total 9

2. (a) system resources exist in separate nodes of a network (with transparent access by users);
Tasks can be shared between different nodes; *must imply shared processing*
R *idea of mainframe and terminals* **1**
- (b) network with File server / print server / webserver; **A** client-server; **1**
A *an application or specific example e.g. search engines, Internet*
R *brand names*
- (c) able to share resources; **A** *data, hardware for resources*
share processing of task among several processors;
local processing done locally;
maximise use of resources // faster execution of complex calculation **2**
- Total 4**

3. (a) (i) *Multi-programming:*
 concurrent/apparent simultaneous; execution of two (or more) programs;
 A two (or more) programs seem to be running at the same time;; **2**
 A *job, process, thread, sequence of instructions instead of program*
- (ii) *Process:* a program currently executing//waiting to be executed
 an instance of a program: // a program in a phase of execution;
R *task/application instead of program* **1**
- (b) (i) *allow addresses in the Pointer column.*

Position	Name	Running Time	Address	Pointer
1	Process6	7	01400	4 (02300)
3	Process7	17	01700	5 (04100)
4	Process2	17	02300	3 (01700);
5	Process9	45	04100	-1; A 0;
6	Process5	2	01200	8 (01900)
8	Process19	5	01900	1 (01400);

1 mark for 4,5,3 correct

1 mark for null pointer correct
 A sensible const. Name representing null pointer

1 mark for 8,1 correct

3

- (ii) array; of records; *OR* linked list; of records; *OR* 4 1-D arrays; one for each column; *OR* one 1-D array for process name; one 2-D arrays for numerical data; **2**
- (iii) *Marks to be allocated as follows:*

<p><i>l</i> for initialisation</p> <p><i>l</i> for while not at end of list</p> <p><i>l</i> for printing</p> <p><i>l</i> for getting <u>next</u> pointer</p> <p>P1 if headpointer is reassigned</p>	<pre>ListPointer ← HeadPointer; While ListPointer <>-1 Do; Print ListArray[ListPointer].Name; ListPointer ← ListArray[ListPointer].Pointer;</pre>	Any name acceptable for ListPointer and ListArray
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Note: a sorting method gets a maximum of 3 marks (inefficient) **4**

Alternative solution:
 REPEAT UNTIL next=-1 *OR* IF listpointer <>-1 then REPEAT....

(iv)

List	Reason
List of suspended/blocked/halted/unrunnable processes;	waiting for a resource or complete a requested I/O transfer;
List of inactive/dormant jobs;	Waiting to be admitted to the system;

I currently running processes I interrupt **2**

Total 14

4. (a) interrupt: a signal; (from a device) seeking the attention of the processor; **2**
- (b) interrupting device supplies;
 an offset; **A** index / indexed address **R** index register
 added to the base address; **A** base register *instead of* base address
 added to the base address; **A** base register *instead of* base address
 gives (start) address of interrupt service routine / ISR / interrupt handler; **3**
 OR A location as BOD
 The number supplied by interrupting device;
 Is an absolute address of a location;
 That is the (start) address of the ISR / interrupt service routing / interrupt handler;
I anything about priorities A location as BOD
Note: Question is not about how an interrupt is being serviced

Total 5

5. (a) produces re-useable code because of inheritance/encapsulation; Produces re-useable objects;
 data is protected // only accessible in well-defined ways (because of encapsulation);
 more efficient to write programs which use pre-defined / inherited objects / classes;

storage structure of data and method code of a class may be altered without affecting programs that make use of the class;

code produced contains fewer errors / more reliable;

solutions are easier to understand (when expressed in terms of objects);

easier to enforce design consistency; easier to debug;

less maintenance effort required by developer since objects can be re-used;

new functions can be added to objects easily (because of inheritance);

R Easier to program **I** references to GUIs **2**

- (b) 1 mark for correct base class and derived classes incl. containers;

1 mark for 2 correctly directed arrows;

<p>R E-R diagrams I methods listed in containers</p>	2
---	----------

(c) Member = Class

(Public)

(procedure) AddNewMember(s);

(procedure) AmendMember(s)

(Procedure) ShowMember(s);

} ; no mark if methods are private

Private

; 1 mark for all data fields marked as private

MembershipNo : Integer

} **A** string/text as data type **R** number

<p>A ID A FName A SName A Tel</p>
--

FirstName: String/text

} ;

Surname: String/text

TelephoneNumber: string/text

; **R** number/integer as data type

4

End (Class)

Public may come after Private. Each line may be preceded by Public or Private & in no particular order **R** diagrammatic answer **I** case **I** white space

Total 8

6. (a) the set / list of bit patterns / binary codes representing machine operations;
the set / list of bit patterns / binary codes for which machine operations have
been defined;
 The collection of different operations available; **A** complete set *instead of the*
 set
Note: must imply all available opcodes
R anything that sounds like a program 1

- (b) a storage unit where datum/data item/instruction is temporarily stored;
 storage unit that can be accessed rapidly;
 a special high-speed memory location;
 storage unit internal to the processor;
 storage unit that can be symbolically identified; 1

Must imply individual items, eg during FE cycle
R piece of memory instead of storage unit
 Answer must distinguish register from buffer

- (c) (i) 75 is the number to be copied/stored in the accumulator/load accumulator with value 75; 1
- (ii) The contents of the accumulator is to be copied/stored at address 75;
A location *inst. of* address 1
- (iii) (The contents of location) 75+;(X)/contents of X; (is to be loaded into the accumulator) 2
- (iv) The contents of the accumulator is to be stored in the location whose address is stored; at address 75;
A *diagrammatic answer* 2
- (d) (i) 195; 1
- (ii) as a shorthand / because it is easier/quicker to read (than lots of 0's and 1's) /less likely to make mistakes; 1
 Saving space **T.O.**, saving processor time **T.O.**
- (iii)

Program Counter	Content of Index Register X	Content of Accumulator A
00A3	-	-
00A4	1;	-
00A5	1	C3 / 195 / 11000011;
00A6	1 } ;	C8 / 200 / 11001000;

Accept trace table moved up 1 row 4

- (iv) contents of accumulator / C8 / 200 / 11001000 is stored at address 00A2; 1

Total 15

7.	(a)	BE4; <i>must be capital letters</i>		1
	(b)	190.25 / $190 \frac{1}{4}$;;	<i>one mark for correct integer part, one mark for correct fractional part one mark for correct working (e.g. correct place values)</i>	3
	(c)	-1052;;	<i>1 mark for workings if result incorrect 1 mark for sign, 1 mark for 1052</i>	2
	(d) (i)	-8.25 / $-8 \frac{1}{4}$;;;	<i>partial marks for workings if result incorrect 1 mark for sign, 1 mark for moving binary point 4 places or showing 2^4</i>	3
	(ii)	starts with 1 0	<i>the first 2 binary digits are different; a significant bit is stored after the (implied) binary point; bit after (implied) binary point different from bit before binary point;</i>	1
		A all leading 1's have been removed // there are no leading 1's;		
		R there are no leading zeros		
			Total	10

END OF CPT4 MARK SCHEME