

**CAMBRIDGE INTERNATIONAL EXAMINATIONS**

**GCE Advanced Subsidiary Level and GCE Advanced Level**

## **MARK SCHEME for the May/June 2013 series**

### **9691 COMPUTING**

**9691/12**

Paper 1 (Written Paper), maximum raw mark 75

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 (a) **buffer** – any **one** from:  
 temporary storage area used to hold data before being transferred  
 allows for difference in working speeds (of processors and peripheral devices)

**interrupt** – any **one** from:  
 signal sent to the processor/CPU (which causes break in the execution of current routine) [2]

(b) (i) Any **three** points from:

data is transferred from (primary) memory to printer buffer  
 when the buffer is full, the processor can carry on with other tasks  
 printer buffer is emptied to printer  
 when printer buffer is empty, printer sends an interrupt to the processor  
 requesting more data to be sent  
 according to priorities [3]

(ii) Any **two** points from:

first (block) of data sent to the *first* buffer  
 whilst this data is being printed by the printer  
 next block of data is sent to the *second* buffer  
 when the *first* buffer is empty  
 data from the *second* buffer is then printed  
 meanwhile more data is then sent to the *first* buffer  
 this continues until all data has been processed by the printer [2]

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2 (a) 1 mark for naming type of media + 1 mark for description/examples

**magnetic media**

surface coated with magnetic material  
magnetic properties altered to represent 1s and 0s  
used by hard disks, magnetic tapes, floppy disks

**optical media**

surface coated with light sensitive material  
read/written by lasers  
CDs use one spiral track  
used by DVD-RAM, CD-R, CDROM, CDRW, blu-ray disc

**solid state media**

uses millions of tiny transistors  
where movement of electrons controlled within a microchip  
has no moving parts  
used by memory sticks, MP3 players, cameras/mobile phones

[6]

(b) (i) Any **two DIFFERENT** points from:

**RAM**

contents can be altered/written to  
holds data/program currently in use  
volatile memory/temporary memory/contents lost when switched off  
usually has a greater memory capacity than ROM

**ROM**

contents can be read only/can't be altered  
holds bootstrap/BIOS/system data  
non-volatile memory/permanent memory/retains contents when switched off

[2]

(ii) Any **two** points from:

needs RAM to store instructions given by the user  
needs RAM to temporarily store program controlling car  
needs RAM to store current radio frequencies to control car

needs ROM to store the factory settings/basic instructions  
needs ROM to store radio frequencies (etc.) understood by remote controller  
needs ROM to store start up routines when car switched on

[2]

3 (a) (i) Any **one** point from:

transmission is sent in one direction only  
 along a single data line  
 Reject single CABLE

[1]

(ii) Any **one** point from:

transmission can be in both directions at same time  
 along several data lines/one data line per bit

[1]

(b) (i)

letter	bytes adjusted for even parity							
<b>C</b>	1	1	0	0	0	0	1	1
<b>O</b>	1	1	0	0	1	1	1	1
<b>M</b>	0	1	0	0	1	1	0	1
<b>P</b>	0	1	0	1	0	0	0	0
<b>U</b>	0	1	0	1	0	1	0	1
<b>T</b>	1	1	0	1	1	0	0	0
<b>I</b>	1	1	0	0	1	0	0	1
<b>N</b>	0	1	0	0	1	1	1	0
<b>G</b>	0	1	0	0	0	1	1	1

(–1 mark for each error in the first column)

[2]

(ii) **0 1 0 1 1 1 0 0**

[1]

(iii) Any **three** points from:

character “P” flagged as having *odd parity* (row 4 in diagram)  
 parity byte sent with data i.e. 0 1 0 1 1 1 0 0  
 column 5 also has *odd parity* (or equivalent)  
 faulty bit must be in row 4 and column 5  
 idea of auto correction of fault (in row 4, column 5)

(Check if diagram has been annotated to show faulty bit)

[3]

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4 (a) 1 mark for name of device + 1 mark for reason

**scanner**

to produce an electronic/digital map version of the passport photograph (scans) into computer readable format

**digital camera/video camera**

to produce an electronic image of the passenger's face produces a similar format to the scanned image

[4]

(b) (i) 1 mark for each point

use of a pressure sensor  
sends data back to computer system  
need for conversion to digital form (ADC)  
computer calculates weight based on sensor data  
this calculated value is compared / (or equivalent) to stored values  
sends weight back to a small screen at check-in  
if weight exceeds airline limit, operator warned at check-in by, e.g., a flashing screen or beeping sound / if weight below limit luggage accepted

[3]

(ii) 1 mark per point

(labels printed in form of) a barcode  
barcode is unique  
use of barcode reader/scanner  
barcode is used as a key field in passenger record  
barcode read at each stage .....  
... and this data is stored in passenger record  
thus allowing tracking/whereabouts of luggage at any stage

[2]

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5 (a) 1 mark for naming type of diagram + 2 marks for description/examples

**data flow diagram (DFD)**

graphical representation of flow of data through the system  
 shows what data is input and output from the system  
 shows where data comes from and goes to and where it is stored  
 contains process, flow, store and terminators

**systems flow chart/diagram**

way of displaying how decisions are made to control events  
 shows devices (e.g. disk drives)  
 shows media use for input/output and storage (e.g. paper output)  
 shows what files are used in the system

**Program flowchart/Jackson structured diagram**

shows method of solution  
 shows data inputs and outputs  
 shows modularisation

If NO valid diagram stated then cannot get features for that part of the answer  
 REJECT flowchart alone

(accept examples/diagrams as part of explanation reflecting description above)

[3]

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(b) 1 mark for each item + 1 mark for reason

**purpose of the system**

this allows another programmer to know what the aim of the software is

**program listing/coding**

if an error occurs in the original program this allows another programmer to alter the coding to cure the fault

**flowchart/algorithm**

these will show the logical steps in the program or system so another programmer can follow the logic

**input/output formats**

allows another programmer to test the system to see if it produces expected results

**hardware and software requirements**

useful if a system needs to be upgraded so another analyst can decide exactly what hardware or software would need to be changed/ ensure new hardware is compatible

**list of variables/data dictionary**

this allows another programmer to understand what the variables represent so they can understand the coding

**file structures**

this is important so that another programmer knows if they are fixed length etc. and how the data is arranged in the file

**test plans/sample runs/test data**

this is important so that another programmer can see how the original software performed and to see how it was tested

**validation rules**

knowledge of these rules will let a programmer know what error trapping exists within the software  
so that new data follows the same rules

**meaning of error messages**

this helps another programmer understand what is going wrong with the software [4]

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6 (a) (i) 1 mark for each correct output device + 1 mark for each reason

**production**

**dot matrix printer**

factory environment could be dirty/dusty/damp  
need to produce stickers from continuous stationery

**design office**

**large computer screen/monitor**

need to be able to see new designs very clearly  
if screens are CRT it is possible to use light pens

**(graph) plotters**

to produce “blue-prints” which can be used to build prototypes  
often necessary to produce full size drawings of new product

**3D printers**

these allow production of solid prototypes/models that work  
reduces cost of tooling up to make a real working example

**marketing**

**laser printers**

producing large numbers of brochures/catalogues/flyers  
quiet operation in office environment  
high speed operation when producing large print runs

**screens**

to show dialogue/script when answering customer queries

**headphones**

to hear customer queries

**finance**

**dot matrix/impact printer**

pay slips produced on continuous stationery  
“hidden information” in ready sealed envelopes

**laser/inkjet printer**

produces payslip for later sealing  
none secure  
NE to produce hard copy of a wage slip

[8]

(b) Any **three** points from:

large coloured graphics showing process  
green colour to show ON and red colour to show OFF  
flashing/highlighted colours used to indicate error/attention required  
layout needs to allow links to other screens showing other part of process  
layout should be clear and easy to use  
ability to “click on”/choose graphic to show status of the item  
use of input devices such as touch screens, trackerballs and keyboards/keypads to allow selection etc.  
use of output devices such as large screens, printers and speakers/ beepers to produce plant data and warn of problems

[3]



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- 7 (a) (i) Any **two** points from:  
 (use of a 2-dimensional array) **Grid** [1:3, 1:3]  
 use 1 value for “X” and 0 value for “O” or characters “X” and “O”  
 each square in game corresponds to position in array .....  
 ... e.g. 1 value in **Grid** [1, 1], 0 value in **Grid** [2,1] and so on  
 each time a square is “filled in” the position is identified and appropriate value stored in  
 correct position in array **Grid** [2]
- (ii) integer/char [1]
- (iii) 1/null/space [1]

(b) Any **four** points from:

each array position is scanned  
 each row is checked e.g. first row: **Grid** [1, 1], **Grid** [2, 1] then **Grid** [3, 1] and so on  
 computer checks to see if all three values in the row are the same ...  
 ... if they are all 1s then “X” has won; if all 0s then “O” has won \*  
 each column is checked e.g. first column: **Grid** [1, 1], **Grid** [1, 2] then **Grid** [1, 3] and  
 so on  
 computer checks to see if all three values in the column are the same  
 ... if they are all 1s then “X” has won; if all 0s then “O” has won \*  
 each diagonal is checked e.g. **Grid** [1, 1], **Grid** [2, 2] then **Grid** [3,3] OR **Grid** [3, 1],  
**Grid** [2, 2] then **Grid** [1, 3]  
 computer checks to see if all three values in diagonal are the same ...  
 ... if they are all 1s then “X” has won; if all 0s then “O” has won \*  
 this scan is carried out each time a square has been filled in  
 \* this answer can only be accepted once

If an algorithmic approach has been applied mark along the following lines:

initialise flag before checking array  
 concept of looping for a row  
 concept of looping for a column  
 recognising position in an array  
 check symbol in adjacent cells is the same  
 flag or recognition of change in content [4]

(c) 1 mark for device + 1 mark for reason

**touch screen**

user only has to touch a square on screen to make choice  
 computer knows player is “X” and puts an “X” where screen touched

**mouse/trackerball/trackpad**

user moves cursor/arrow and points to chosen square  
 “click” to confirm and “X” is placed in chosen square

**keyboard**

move cursor/arrow by using ↑ ↓ ← → keys  
 press <ENTER> key when chosen square found [2]

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8 (a) record key is used  
the key value is subjected to arithmetic algorithm  
to give/calculate the location/address of the record [3]

(b) 1 mark for chosen method + 1 mark for description

**use of overflow/bucket area used**

any record that is subject to a collision is placed, serially, in overflow area  
set flag when overflow / bucket is in use

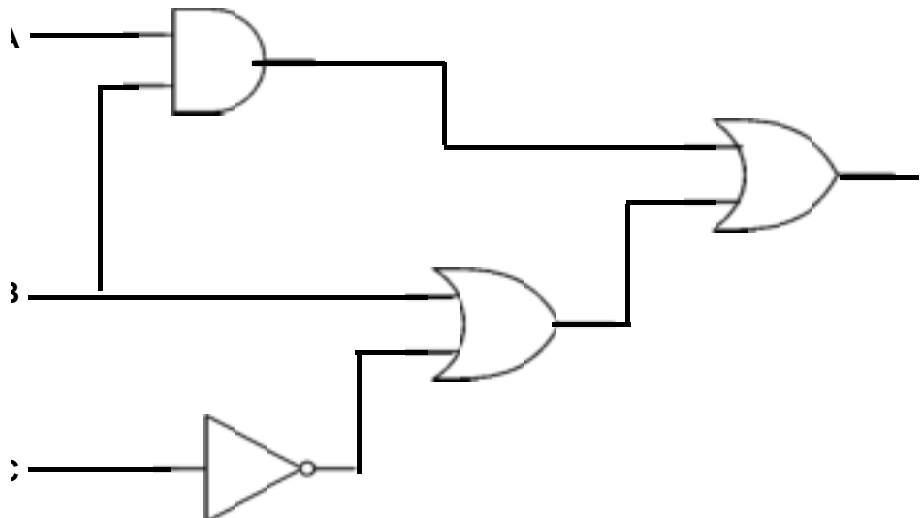
**use of linked lists**

original location acts as head of list and points to a list of any records that have been  
subject to a collision

**use of next location after occupied one is used**

this continues until empty location is found [2]

9 (a) 1 mark for each correct logic gate (accept other logic gate nomenclature)



If a candidate has only one input to AND gate or an OR gate they lose the mark for that gate [4]

(b)

A	B	C	X
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	1

[4]