AQA

General Certificate of Education (A-level)
January 2012

Computing   **COMP2**

(Specification 2510)

Unit 2: Computer Components, The Stored Program Concept and The Internet

Final

Mark Scheme

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all examiners participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for standardisation each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, examiners encounter unusual answers which have not been raised they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

See bold vertical line for an amendment made to version 2.0 of the mark scheme.

To Examiners:

1. **When to award '0' (zero) when inputting marks on CMI+:** A mark of 0 should be awarded where a candidate has attempted a question but failed to write anything creditworthy. Insert a hyphen when a candidate has not attempted a question. By these two actions the Principal Examiner will be able to distinguish between the two (nothing credit worthy/unattempted) when analysing any statistics.

2. This mark scheme contains the correct responses which we believe that candidates are most likely to give. Other valid responses are possible to some questions and should be credited. Examiners should refer off mark scheme responses that they believe are creditworthy to a Team Leader.

Notation used in GCE Computing mark schemes:

;	- means a single mark
//	- means alternative response
/	- means an alternative word or sub-phrase
A	- means acceptable creditworthy answer
R	- means reject answer as not creditworthy
I	- means ignore
DPT	- means "Don't penalise twice". In some questions a specific error made by a candidate, if repeated, could result in the loss of more than one mark. The DPT label indicates that this mistake should only result in a candidate losing one mark, on the first occasion that the error is made. Provided that the answer remains understandable, subsequent marks should be awarded as if the error was not being repeated'.

Qu	Part	Sub-part	Marking Guidance	Marks	Comments
1	**a**		Third (generation) // 3; **R** High Level Language	**1**	Do not reject high level language if answer also contains '3ʳᵈ generation' – refer upwards for anything else.
1	**b**	**i**	Hexadecimal // base 16; **A** Hex	**1**	Hex used in textbook
1	**b**	**ii**	Take up less space when printing/viewing; **NE** takes up less space Less likely to make errors; Op-codes are easier to recognize; Easier to understand; Less time taken when coding as more concise // quicker to program;		

			NE – easier to read **NE** – quick to write	**MAX 1**	
1	**b**	**iii**	Lowest address : 00 Highest address : FF BOTH correct to gain one mark; Accept 0 for lowest address Accept 255 for highest address	**1**	Accept notation in front of hex &, $
1	**c**		When coding for execution speed; When coding to minimize object code size; When writing code to control devices / directly access hardware; **A** When coding for a specific processor; **A** – by example if maps to one of the above	**MAX 1**	
1	**d**		A compiler produces object code/machine code; whilst an interpreter does not produce any object code; Interpreted code will execute slower; than executing the object code produced by a compiler; You always need the interpreter to interpret source code; but you do not need the compiler to execute a compiled program; Once compiled source code is no longer required to run the program; An interpreter always needs source code at runtime; Compiled code can only be executed on a machine with the same processor type / instruction set; Interpreted code is more portable; A compiler translates the whole source code (at once); An interpreter analyses the code line by line; **NE** – reads	**MAX 4**	
2	**a**		$X \oplus Y$; $X.\overline{Y} + \overline{X}.Y$; **A** alternative notations : X XOR Y X EOR Y X AND NOT Y OR NOT X AND Y	**1**	Acceptable notation for symbols : For X.Y allow $X \wedge Y, X \cap Y, XY$ For X+Y

					allow $X \vee Y, X \cup Y$ For X allow $\sim X$
2	**b**		$X\bar{Y};$ A alternative notations : X AND NOT Y;	**1**	
2	**c**	**i**		**2**	

Table under 2 c i:

Inputs		Outputs	
X	**Y**	**C**	**S**
0	0	**0**	**0**
0	1	**0**	**1**
1	0	**0**	**1**
1	1	**1**	**0**

One mark for C column;
One mark for S column;

2	**c**	**ii**	Addition // adder; **A** sum;	**1**	
2	**d**				NOTE : Mark against one of the answers included. MAX 2 for working/method if mistakes occur. Any new solutions refer to team leader.

$(X + Y).(X + \bar{Y})$
                [Fully expanding brackets – **1 mark**]
$X.X + X.\bar{Y} + Y.X + Y.\bar{Y}$
    [Recognising $X.X = X$ OR $Y.\bar{Y} = 0$ – **1 mark**]

$X + X.\bar{Y} + Y.X + 0$
                [Taking X outside brackets – **1 mark**]
$X(1 + \bar{Y} + Y)$ OR $X + X(\bar{Y} + Y)$

X [Final Answer, **1 mark**]

Alternative Answer : (Distributive)

$(X + Y).(X + \bar{Y}) = X + (Y.\bar{Y})$
[Use of distributive law – 1 mark]

$X + (Y.\bar{Y}) = X + 0$
[Recognising $Y.\bar{Y} = 0$ - 1 mark]

X + 0 = X [1 mark]

X [Final Answer, 1 mark]

Alternative Answer : (De Morgan's)

$\overline{\overline{X + Y} + \overline{X + \bar{Y}}} = Q$
                [Use of De Morgan's – **1 mark**]

$$\overline{X + Y} + \overline{X} + \overline{Y} = \bar{Q}$$

$$\overline{\overline{X}.\overline{Y}} + \overline{\overline{X}}.\overline{\overline{Y}} = \bar{Q}$$
[Two further applications of De Morgan's]
$$\overline{X}.\overline{Y} + \overline{X}.Y = \bar{Q}$$

$$\overline{X}.(\overline{Y} + Y) = \bar{Q}$$
[Taking X outside brackets – **1 mark**]
[Recognising ~Y + Y = 1 – **1 mark**]
$$\overline{X}.1 = \bar{Q}$$
[Recognising X.1=X – **1 mark**]

$$\overline{X} = \bar{Q}$$

X = Q   [Final answer, **1 mark**]

MAX 3 for working/method;
1 for final answer

X on own with no working gains 1 mark.

MAX 4

Number	Component
1	Memory address register; **NE – MAR;**
2	Data bus;
3	Control bus;

3 a — **3**

3 b

To fetch / decode / execute instructions;
To synchronise operation of processor;
To marshal/control operation of fetch-execute cycle;
To send control signals/commands to other components of fetch-execute cycle;

To control the transfer of data between registers/MBR;

A – by example
NE - information

MAX 1

3 c

Arithmetic (and) logic unit;

NE – Arithmetic unit
NE – Logic unit

1

3	d		A (very fast) memory location within the processor; **A** - A (very fast) memory location within an I/O controller;	**1**	
3	e		Arithmetic results – Overflow/underflow/positive/negative/zero/carry; Interrupts (enabled/disabled); Parity; BCD arithmetic enabled/disabled; Supervisor mode; Halt; **A** illegal instruction/operation	**MAX 1**	Refer to team leader with other potentially correct answers.

4	a		**Purpose**	**Media**		Mark on first occurrence of each medium.
			To distribute commercial software	CD-ROM // CD-R // DVD-R;		
			To store a 20GB high definition movie file	Blu-ray disc;		
			To use for a 3GB archive of a school server	DVD-R // DVD-RW // Blu-ray disc;		
			To create a copy of a music album	CD-R // CD-RW;		
			NOTE : Mark first occurrence of each medium		**4**	

4	b		WRITE : To write data a high powered/ high frequency laser makes sections less reflective / burns a pit; **R** – laser writes grooves/tracks; READ : A low powered laser is used to read data back from the disk; MECHANISM : The difference between reflective and non-reflective parts / pits and lands indicates the 1s and 0s; The data is stored as a continuous spiral track; One mark each for write, read and mechanism. NOTE: a laser is used to read and write data (1 mark only)	**MAX 3**	

4	c		No hardware exists to read CD-R disks; The CD-R medium has become corrupted // CD-R is scratched/damaged/degraded; Support for file format no longer available // no software capable of reading format data stored in CD-R;	**MAX 2**	
5	a		To examine the destination of each packet; To forward packets from one network to another; To manage congestion; Choose an appropriate forwarding route; Route packets according to destination IP address; Store incoming packets temporarily; Change link address in packet; To store/make use of a routing table; **A** – data instead of packets **R** – information / signals	**MAX 2**	
5	b		SMTP; POP(3); IMAP(4); **A** full names of the protocols above	**MAX 1**	**A** ESMTP // SMAP // LMTP // QMTP
5	c		**Key Points of Subject Criteria** Concept that data passed up/down between layers; **A** by example – just one needed but must be correct **NE** just describing the layers in the correct order Application layer selects appropriate protocol for the communication // protocol mentioned by example (POP / HTTP); Application layer is to interact with the user via the email client / web browser; Transport Layer: Transport layer establishes end to end communication // Transport layer establishes a virtual path // TCP layer establishes connection between client and server; Destination and source application level client/server identified by port numbers; TCP layer uses these port numbers to route reassembled requests/responses to correct application layer client/server; TCP layer splits and reassembles requests/responses into packets/from packets; Packets are numbered by transport layer; Transport layer deals with error control (acknowledgements/retransmission);		

Network layer adds source and destination IP addresses;
Routers use destination IP addresses to route packets to destination // network layer involved with packet routing;

Link layer adds source and destination hardware/Ethernet/Link layer/MAC addresses;
Link layer destination and source addresses change from link to link;
Link layer moves packets between 2 internet hosts;
Link layer deals with physical connection/cabling;
A Link layer includes network card / drivers;

Network layer strips IP address (when receiving) // Link layer strips MAC address (when receiving);

Server uses received source IP address to know where to send response;
Server uses received client port number to know to which instance of application layer client to send response to;
Servers use well-known ports;
Client port numbers come from the dynamic range;
Packets of Email client/server and Web browser/Web server travel independent paths;
Packets of Email client/server and Web browser/Web server share links//intermingled on links;

Combination of IP address and Port = Socket / described;

NOTE : Accept answers where candidate uses the IP addresses and ports indicated in figure 6 to match up with statements above
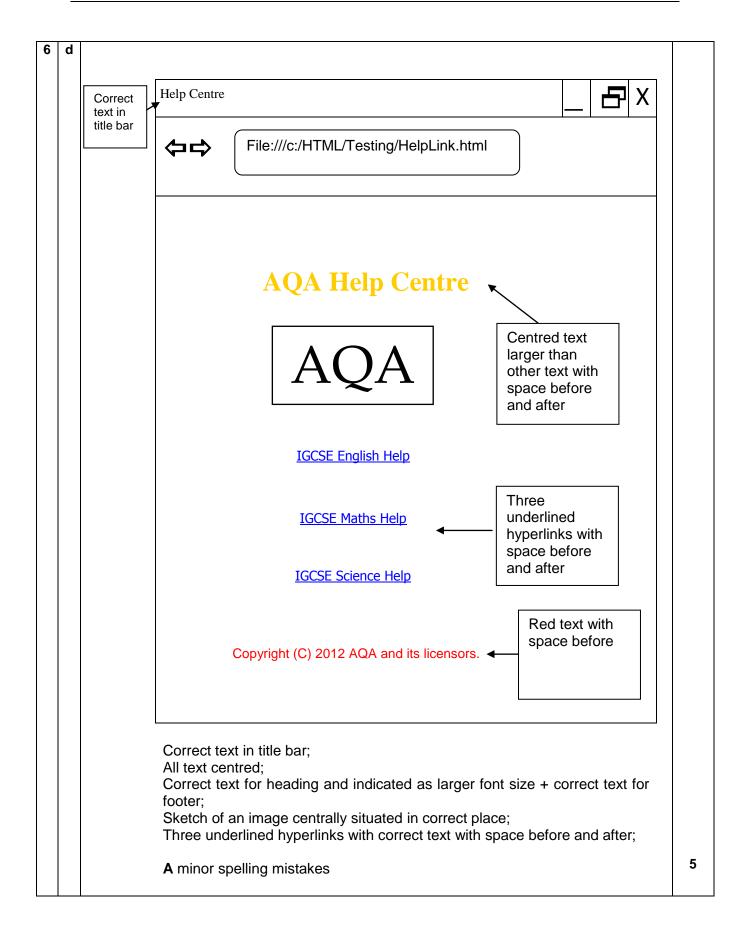
Mark bands and description	
5-6	To achieve a mark in this band, candidates must meet the subject criterion (SUB) and all of the 5 quality of written communication criteria (QWCx).
	SUB Candidate has made at least 5 valid points covering.
	QWC1 Text is legible.
	QWC2 There are few, if any, errors of spelling,

				punctuation and grammar. Meaning is clear. *QWC3* The candidate has selected and used a form and style of writing appropriate to the purpose and has expressed ideas clearly and fluently. *QWC4* Sentences and paragraphs follow on from one another clearly and coherently. *QWC5* Appropriate specialist vocabulary has been used.	
			3-4	To achieve a mark in this band, candidates must meet the subject criterion (SUB) and 4 of the 5 quality of language criteria (QWCx). SUB Candidate has made at least 3 valid points. *QWC1* Text is legible. *QWC2* There may be occasional errors of spelling, punctuation and grammar. Meaning is clear. *QWC3* The candidate has, in the main, used a form and style of writing appropriate to the purpose, with occasional lapses. The candidate has expressed ideas clearly and reasonably fluently. *QWC4* The candidate has used well-linked sentences and paragraphs. *QWC5* Appropriate specialist vocabulary has been used.	
			1-2	To achieve a mark in this band, candidates must meet the subject criterion (SUB). The quality of language should be typified by the QWCx statements. SUB Candidate has provided at least one point from the above. *QWC1* Most of the text is legible. *QWC2* There may be some errors of spelling, punctuation and grammar but it should still be possible	

				to understand most of the response. *QWC3* The candidate has used a form and style of writing which has many deficiencies. Ideas are not always clearly expressed. *QWC4* Sentences and paragraphs may not always be well-connected or bullet points may have been used. *QWC5* Specialist vocabulary has been used inappropriately or not at all.		
			0	Candidate has not made reference to any of the points above.	**6**	
6	**a**		Yellow;		**1**	
6	**b**		Tahoma;		**1**	
6	**c**		C:/Image/AQALogo.gif; C:/HTML/Testing/Image/AQALogo.gif; **A** \ instead of /		**1**	

6	d	

Correct text in title bar;
All text centred;
Correct text for heading and indicated as larger font size + correct text for footer;
Sketch of an image centrally situated in correct place;
Three underlined hyperlinks with correct text with space before and after;

A minor spelling mistakes

5

7	a		An ISP sells clients Internet access/connection; Provides users with access to Internet backbone; **R** – provides an Internet service	**MAX 1**	
7	b		Clients may have broken Copyright, Designs and Patents Act; Digital Economy Act; **R** Copyright, Copyright Act	**MAX 1**	
7	c		Data which relate to a <u>living</u> individual who can be <u>identified</u> from that data // data about a <u>living</u> <u>identifiable</u> person;	**1**	
7	d	i	ISP has (potentially) broken Data Protection Act (by not securing personal data);	**1**	
7	d	ii	(Clients have potentially misused/hacked their ISP's computer system) therefore clients have broken the Computer Misuse Act; **R** they may have broken the law	**1**	
8			Exactly same operation performed over and over again by programmed robot sprayer; Position of car bodies predetermined//car bodies in known precise positions all the time// Robot sprayer does not need to deviate from pre-programmed position at any time // a strictly controlled environment; Actions to be performed known in advance for programmed robot sprayer; Programmed robot sprayer requires only limited sensing of environment if any // fewer inputs to monitor; Robot sprayer does limited processing; Robot sprayer has a relatively simple program which is numerically controlled; Car system has to continuously monitor many external variables; Car system has to perform very complex processing; Car system will need very powerful processors; Car system will need a range of sensors; Car system has to analyse/react to an input very quickly (and then adjust one or more of the three given outputs to alter car motion); The environment in which the car operates is not predictable//is more complex//has greater uncertainty;		

				Car system needs to know at all times exactly where it is;		
				Candidate may answer by example, e.g. Car system cannot be programmed in advance to know where all pedestrians will be at any one time // Car cannot be programmed in advance to know where all other moving cars will be at any one time // Car system cannot be programmed in advance to know where all stationary obstacles such as parked cars will be//potholes at any one time;		
				NOTE : For full marks candidate must cover both problems	**MAX 4**	