General Certificate of Education (A-level)
January 2013

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.

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COMPONENT NUMBER: COMP2

COMPONENT NAME: COMPUTER COMPONENTS, STORED PROGRAM CONCEPT AND THE INTERNET

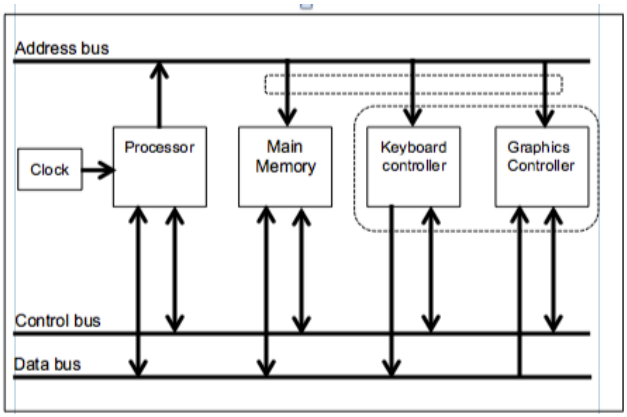
1. This mark scheme contains the correct responses which we believe that candidates are most likely to give. Other valid responses are possible to some questions and should be credited. Examiners should refer off mark scheme responses that they believe are creditworthy to a Team Leader.

The following annotation is used in the mark scheme:

; - 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
NE - means not enough
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			***Hardware:*** physical components // devices (that make up the computer) // electrical circuit // electrical components (that make up the computer); **NE** components ***Software:*** programs/instructions that are run/executed (by the computer); **A.** codes that are run/executed **A.** programs that enables computer to run **A.** programs that allow user to perform tasks	**2**	Need both parts to gain mark

2	**a**		A set of/group of/parallel wires/lines; that are used to connect together components (inside the computer) // connect different parts of the CPU; in order to pass signals between them; **R** a wire **A.** connect different parts of the computer **NE** data	**MAX 2**	Wires needs to be qualified with set/group

2	**b**		Instructions; **A.** Commands / machine-code **R** signals ***Examples of a control signal (max 1):*** Clock/timing; reset; interrupt ACK; interrupt request; bus grant; bus request; status; I/O write; I/O read; memory read; memory write; transfer ACK **A.** interrupt **A.** transfer request **A.** read/write **NE** load /store **NE** clock speed	**2**	**NE** an event that details when an interrupt would be caused
2	**c**		 1 mark – one of processor, keyboard controller or graphics controller identified correctly 2 marks – all three correctly identified Address bus connects the 4 components; Arrow from processor to the address bus; Arrows from address bus to the three other components;	**5**	Mark this on where the candidate has put the components.

3			***General:*** Idea of 'quicker to write' or 'easier to write' [ONE MARK] *EXAMPLES:* Assembly language is quicker to write than machine code // HLL is quicker to write (compared to assembly code) // Assembly language is easier to write than machine code // HLL is easier to write (compared to assembly); [or opposites – slower to write / harder to write] Idea of 'understanding' [ONE MARK] *EXAMPLES:* Assembly code easier to understand than machine code // HLL easier to understand than assembly code; Idea of 'debugging' [ONE MARK] *EXAMPLES:* Assembly code easier to debug than machine code // HLL easier to debug (than assembly code); ***Assembly language:*** Solution expressed in terms of mnemonics; **A.** an example of a full instruction (operand and opcode) Easier to make mistakes in assembly language; Instruction composed of op-code and operand; Solution translated by using an assembler; Code is hard to port to other types of computer // machine-oriented languages; One assembly language instruction relates to one machine code instruction; ***Situation*** – working on embedded hardware // need for small object code size // need for fast execution // need to access hardware/registers directly; ***Imperative language:*** Imperative is where the programmer gives the computer a sequence of instructions to perform; Selection/Sequence/Iteration constructs available; **A.** a full example of a selection/iteration construct Library of pre-written functions available; Solution translated by using a compiler / interpreter; A compiler might not be available for a specific processor (disadvantage); ***Situation*** – anything sensible that would need a	**MAX 8**	

HLL (for example games programming)

Declarative language:
(Certain languages) define what is to be computed rather than how the computation is to be done;
(Certain languages) lack side effects;
(Certain languages) have a clear link to mathematical logic;
(Certain languages) express solutions in terms of facts and rules // rule-based;
(Certain languages) will use an inference engine to work out the answer;
The user asks a question of the system rather than provide an algorithm of the solution;
Uses back-chaining/backtracking;
(Certain languages) express solutions using markup languages (such as HTML);
(Certain languages) express solutions as CSS / regular expressions / (subset of) SQL;
A. example code from part of a declarative program (ie an SQL statement)
Situation – medical diagnosis // expert systems // database query //creating a web page/website ;

Imperative and Declarative language:
Solution expressed in terms of statements written using English-like keywords;
Code easier than assembly language to port to other types of computer;
One language statement maps to many (more than one) machine code instruction;

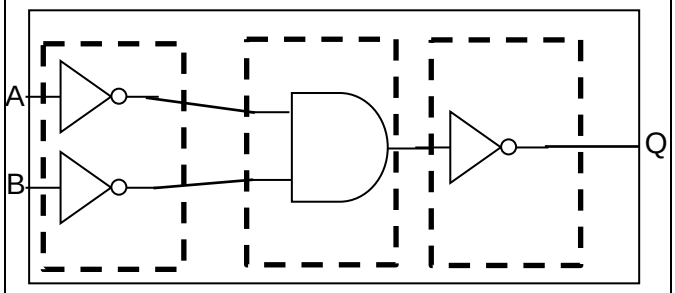
NOTE: accept any sensible situation for each area.

Mark Bands and Description	
7-8	*To achieve a mark in this band, candidates must meet the subject criterion (SUB) and all 5 of the quality of language criteria (QWCx).* *SUB* Candidate has covered all three language generations and made at least 7 subject-related points. *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.
3-6	*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 covered at least 2 of the 3 generations and has made at least 3 subject-related 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) and 4 of the 5 quality of language criteria (QWCx).* *SUB* Candidate may not have covered all generations, but has covered at least one of them. At least one valid point has been made. *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. *QWC5* Specialist vocabulary has been used inappropriately or not at all.
0	Candidate has made no relevant points.

Note: Even if English is perfect, candidates can only get marks for the points made at the top of the mark scheme for this question.

If a candidate meets the subject criterion in a band but does not meet the quality of written communication criteria then drop mark by one band, providing that at least 4 of the quality of language criteria are met in the lower band. If 4 criteria are not met then drop by two bands.

4	**a**		 1 mark – logic of first part satisfies NOT A, NOT B; 1 mark – inputs into an AND gate; 1 mark – output from AND gate passes through a NOT gate and connected to Q;	**3**	

4 b — **4**

A	B	A + B
0	0	0
0	1	1
1	0	1
1	1	1

1 mark for correct A + B column;

A	B	$\overline{A}$	$\overline{B}$	$\overline{A}.\overline{B}$	$\overline{\overline{A}.\overline{B}}$
0	0	1	1	1	0
0	1	1	0	0	1
1	0	0	1	0	1
1	1	0	0	0	1

1 mark for columns $\overline{A}$ and $\overline{B}$ being correct;
1 mark for $\overline{A}.\overline{B}$ column being correct;
1 mark for $\overline{\overline{A}.\overline{B}}$ column being correct;

NOTE: Can follow through into $\overline{A}.\overline{B}$ column from previous two

4 c — **1**

De Morgan's (law);

4 d — **3**

Mark allocation:

One mark for taking either A, NOT C or A AND NOT C outside of brackets to produce a correct expression;
One mark for eliminating B in a valid way;
One mark for correct final answer;

Example One:
$A.B.\overline{C} + A.\overline{C}$

$A\,(B.\overline{C} + \overline{C})$ - taking A outside of brackets;

$A\,(\overline{C}\,(B + 1))$ (B + 1) = 1
Simplifying to remove B using B + 1 = 1 ;

$B.\overline{C} + \overline{C} = \overline{C}$
Simplifying to remove B using $B.\overline{C} + \overline{C} = \overline{C}$;

A. $A\,(\overline{C}\,(B + 1)) \rightarrow A.\overline{C}$;

Final answer $A.\overline{C}$

Example Two:

$A.B.\overline{C} + A.\overline{C}$

$A.\overline{C}(B + 1)$ – taking outside of brackets;

(B + 1) = 1; - simplifying to remove B

A. $A.\overline{C}(B + 1) \rightarrow A.\overline{C}$

Final answer $A.\overline{C}$

Truth Table Method

A	B	C		$A.\overline{C}$	$A.B.\overline{C} + A.\overline{C}$
0	0	0		0	0
0	0	1		0	0
0	1	0		0	0
0	1	1		0	0
1	0	0		1	1
1	0	1		0	0
1	1	0		1	1
1	1	1		0	0

(student answer may have more columns than this)

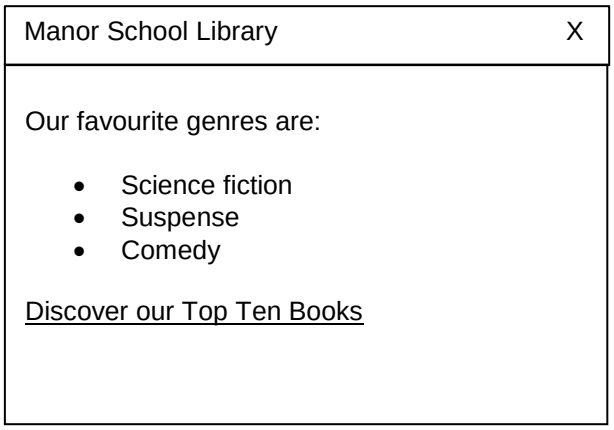
A mark for having correct column for $A.B.\overline{C} + A.\overline{C}$;
A mark for having correct column for $A.\overline{C}$;

Final answer $A.\overline{C}$

5	**a**		Magnetic (medium); Binary digits/bits/0s and 1s/data represented by magnetising spots on disk // changing magnetic properties of disk; Disk made up of platter(s); Disk divided into tracks and sectors; **A.** either tracks or sectors alone Tracks are concentric circles // organised into cylinders; Drive head can move in/out // moves to track/cylinder // moves radially; Disk continuously spinning (while in operation); Disk spins at high speed // feasible example of speed; Data read/written as correct sector passes under read/write head; **A.** drive head Data transferred in sectors/blocks; Medium and drive/device in sealed enclosure; Hard disk drive is a random access device; **A.** Head parked / not over disk when not in use // head must not touch surface when in use; **A.** Use of cache/buffer to speed up data transfer; **MAX 3** if candidate talks about lasers / making holes / pins / engraving	**MAX 4**	

5	**b**		512 MB x 2 = 1024 MB = 1GB 1GB x 1024 = 1 TB 2 x 1024 = 2048 Award mark for a clear movement between MB – GB - TB making use of 1024 ; Final answer: 2048; **Acceptable alternative** (as many hard drive manufacturers do not use the 1024 principle) : 1 TB = 1000 GB = 1000000 MB; 1000 000/512 = 1953.125; (mark to be awarded for understanding the calculation needed) Final answer : 1953.125; **A.** Accept a final answer that has involved some approximation as a no calculator paper. (2000;) **Alternative** $2^{40} / 2^{29}$; = 2^{11} ;	**MAX 2**	
5	**c**		More platters (which are packed closer); Greater density of data on each platter; More tracks on a platter // more cylinders; Change to perpendicular magnetic domains; Ability to write smaller magnetic domains/parts // smaller read/write heads; Use of different alloy materials for the platters;	**MAX 1**	
5	**d**		Faster access speed // faster booting of operating system // faster data transfer/read/write speeds; Silent operation; Are lighter; Less heat generated; Less power required // longer battery life; Less susceptible to damage from physical shocks // more robust (due to no moving parts); **NE** quicker (without explanation) **NE** better performance (without explanation)	**MAX 2**	Accept – quicker as no need to wait for read/write head to move//sector to be underneath read/write head;

6	**a**		WWW (**max 3 marks**) A system of interlinked / hypertext documents; Accessed via the Internet; Using HTTP protocol; **NE** web a collection of web pages Internet (**max 3 marks**) A network of interconnected computer networks; **A.** a network of computers; Using a <u>globally</u> unique address space; Using end-to-end communication protocol // Internet Protocol // "TCP / IP"; Supports a range of application protocols; **A.** two examples of different protocols; **R.** "TCP" **R.** "IP"	**MAX 4**	
6	**b**		Messages split into packets; **A.** chunks Each packet given destination/source address; Each packet dispatched to the Internet through a router/gateway; Packets sent independently; Packets given a sequence number; Routers forward packets (until they reach destination); Path of packet transfer determined by router(s); Packets reassembled at the destination;	**MAX 2**	
6	**c**		**12.23.45.89** An IP (v4) address (that uniquely identifies a machine on the Internet) // Internet protocol address; **80** A port number // a number that specifies which process on the receiving machine/host to send the data to; **A.** port; Denotes that HTTP (server) is recipient of packet // packet is an HTTP packet	**2**	

7	**a**		 'Manor School Library' – in title bar; Line space after 'Our favourite genres are:' with the correct text AND line space after the bulleted list ; Use of un-ordered list with three bulleted points with correct text; Hyperlink identified through underlining or clear label with the correct text; **A.** minor spelling mistakes **MAX 3**: if any errors in drawing of page (for example font size differences or indenting hyperlink)	**4**	
7	**b**	**i**	The text inside the <p> tags/ paragraph will be blue and use the Arial font // The text 'Our favourite genres are:' will be blue and use the Arial font;	**1**	Candidate needs to talk about text being blue
7	**b**	**ii**	#header{ font-size: 36pt; color: green; } **MAX 2** if ; separator missing between 36pt and color 1 mark - #header {} // div {} // div#header{} ; [Not contents] 1 mark – for color: green ; 1 mark – for font-size: 36pt ; NOTE : color must be spelt without the u For green accept #00xx00 where xx in range 01 to FF	**3**	

8	**a**		Copyright, Designs and Patents (Act); **A.** Digital Economy Act	**1**	
8	**b**		No money goes to the artists / publishers / distributors; The quantity/amount of music being produced could go down; (Pirated) music can be of a lower quality;	**MAX 2**	
8	**c**		Can sell on items that have been purchased; Can play on any suitable device // Can be played on many devices that the purchaser might own; Can make backup copies; Can play without any time limit// no limit on amount of plays; Can load into any suitable software package; Encourages creativity / sharing / remixing / reworking; **A.** user has full control over their music	**MAX 2**	

UMS conversion calculator AQA - Uniform mark scale (UMS) conversion