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General Certificate of Education

Computing 2510

COMP2 Computer Components, The Stored Program Concept and The Internet

Mark Scheme

2009 examination - June series

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 meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting 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 the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

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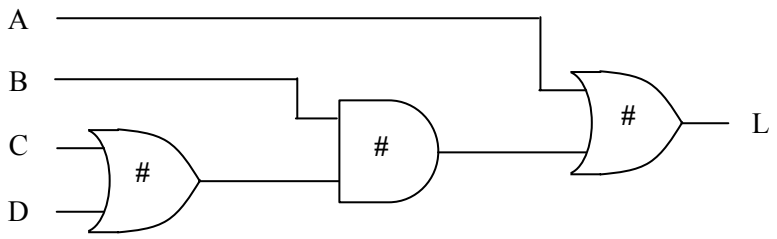
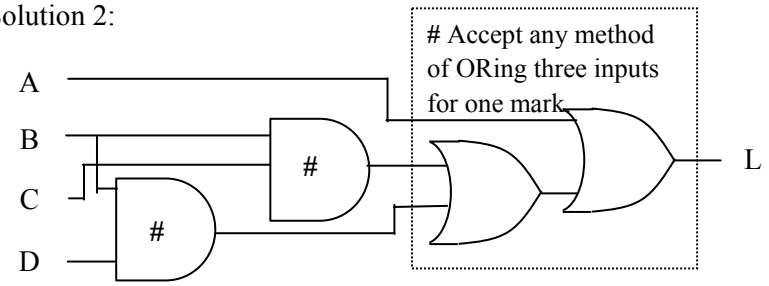
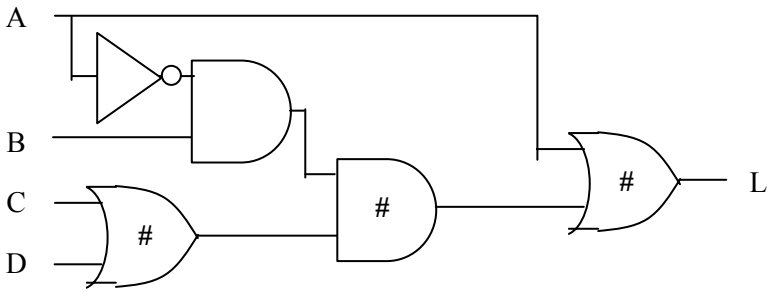
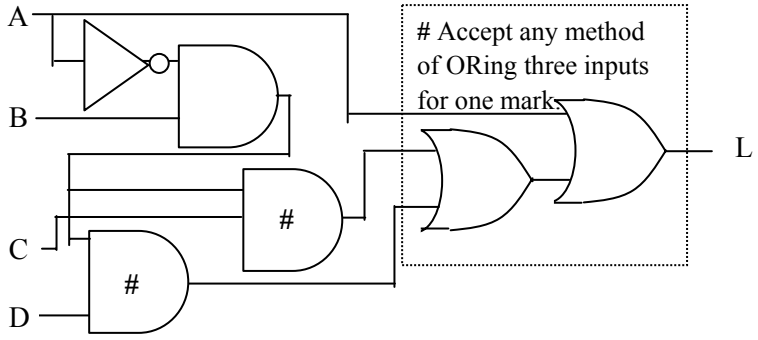
Notation used mark schemes:
; - means a single mark
// - means alternative response
/ - means an alternative word or sub-phrase
A - means acceptable creditworthy answer
R - means reject answer as not creditworthy
I - means ignore.

<table>
<tr><th>Qu</th><th>Part</th><th>Sub Part</th><th>Marking Guidance</th><th>Mark</th></tr>
<tr><td>1</td><td>(a)</td><td colspan="2">A (hardware) device that is <u>not part of the CPU</u>;
An <u>external</u> (hardware) device;
A Not built into/part of (main) computer (system) // Outside computer
R Can be connected to/attached to/plugs into a computer
R Examples alone
R Component for device
R Processor for CPU</td><td>1</td></tr>
<tr><td></td><td>(b)</td><td colspan="2"><table><tr><th>Peripheral</th><th>Input</th><th>Output</th><th>Input/Output (I/O)</th></tr><tr><td>Mouse</td><td>✓</td><td></td><td></td></tr><tr><td>Laser Printer</td><td></td><td>✓</td><td></td></tr></table>1 mark for each correctly placed tick
R Answers with more than one tick on a row.</td><td>2</td></tr>
<tr><td>2</td><td>(a)</td><td colspan="2">Compiler R Interpreter
A Misspellings where meaning remains clear e.g. complier
R More than one answer e.g. compiler or interpreter</td><td>1</td></tr>
<tr><td></td><td>(b)</td><td colspan="2">Assembler
A Misspellings where meaning remains clear
R More than one answer</td><td>1</td></tr>
<tr><td>3</td><td>(a)</td><td colspan="2">Language that specifies what the problem to be solved is/what needs to be done;
Language that does not say how to solve a problem/what algorithm to follow;
Language that does not specify the order in which to carry out actions to solve problem;
Class of languages including functional and logic programming languages;
A Just one of functional or logic programming;
A Language that uses facts and rules</td><td>Max 1</td></tr>
<tr><td></td><td>(b)</td><td colspan="2">Expert systems/Artificial intelligence;
Natural language processing;
Scheduling problems;
Querying a database (R SQL on its own);
Solving logic problems;</td><td>Max</td></tr>
</table>

		A Examples of types of system	**1**
4	(a)	NOR (Gate) **I** case of answer i.e. nor is allowed	**1**

4	(b)	(i)	Solution 1:  Solution 2:  Solution 3 (solution 1 plus check for A off):  Solution 4 (solution 2 plus check for A off):  **1 mark for each correctly linked gate that is marked with a #** **A** 3-input OR gate **P1** for any unnecessary gates in a solution that would otherwise get 3 marks. **P1** for any solution that would not correctly implement the logic but would otherwise get 3 marks. Mark from left to right until first mistake encountered then from right to left. When marking left to right award 1 mark for each gate correctly connected to its inputs. When marking right to left award 1 mark for each gate correctly connected to its output.	**3**

		(ii)	$A + B \cdot (C + D)$ $A + \overline{B} \cdot C + B \cdot D$ $A + \overline{A} \cdot B \cdot (C + D)$ $A + \overline{A} \cdot B \cdot C + \overline{A} \cdot B \cdot D$ **A** Insertion of extra brackets that do not affect logic of expression Note: Expression does not need to match diagram drawn in (i). **A** alternative notations : • For $X \cdot Y$ allow X AND Y, $X \wedge Y$, $X \cap Y$, XY • For X+Y allow X OR Y, $X \vee Y$, $X \cup Y$ • For $\overline{X}$ allow NOT X, $\neg X$	**1**
	(c)	**ALGEBRAIC SOLUTION:** $\overline{\overline{A} + \overline{B}} + B \cdot \overline{A}$ [Application of DeMorgan's Law **1 mark]** $A \cdot B + B \cdot \overline{A}$ $B \cdot (A + \overline{A}) \,//\, B \cdot 1$ [Common term B taken out **1 mark**] B [Correct answer **1 mark**] **A** alternative notations : • For $X \cdot Y$ allow X AND Y, $X \wedge Y$, $X \cap Y$, XY • For X+Y allow X OR Y, $X \vee Y$, $X \cup Y$ • For $\overline{X}$ allow NOT X, $\neg X$ **TRUTH TABLE SOLUTION:**		

				X	**Y**	**Z**
A	B	$\overline{A}$	$\overline{B}$	$\overline{A} + \overline{B}$	$B \cdot \overline{A}$	$\overline{\overline{A} + \overline{B} + B \cdot \overline{A}}$
0	0	1	1	0	0	0
0	1	1	0	0	1	1
1	0	0	1	0	0	0
1	1	0	0	1	0	1

1 mark for both columns X and Y correct
1 mark for column Z correct
1 mark for correct answer (B)
A Rightmost column labelled as L or Q

3

5	(a)	*Rationale:* The key difference is that application software performs a user oriented task whereas system software performs a machine oriented task. *Application Software* – Used to perform task that is independent of computer/that user would have to do if didn't have computer/real world task; **A** You for user **A** Performs a task for the user **R** Task **MAX 1** *System Software* – Software that performs tasks to run computer; Layer of software which enables user to operate computer;	

		Interface between user and computer; Hides complexity of computer from user/provides virtual machine; Software that lets user communicate with/manage hardware; Software to run applications/hardware/programs/computer/ packages; Software required to make computer work; **MAX 1**	**2**
	(b)	Operating System; Library program; **NE** Library Translator/Compiler/Interpreter/Assembler; **A** Translation **R** Examples of types **MAX 2**	**2**
6		**Internal Components** Data Bus 10 Address Bus 9 Control Bus NA *VDU Controller* 8 Disk Controller NA *Keyboard Controller* 7 Main Memory 5 Processor 4 **Peripherals** *Keyboard* 2 *Visual Display Unit* 3 Secondary Storage NA **1 mark for each correct answer (10,9,5,4)** **1 mark for correct pair (8,3)** **1 mark for correct pair (7,2)** **MARK DIAGRAM IF ANSWERS WRITTEN ON IT INSTEAD OF IN TABLES. ANSWERS IN TABLES OVERRIDE ANSWERS ON DIAGRAM.**	**6**

7	(a)		**Step 1:** MAR ← [PC] / Contents of program counter transferred to MAR; **Step 2b:** MBR ← $[Memory]_{addressed}$ / Contents of addressed memory location loaded into MBR; (must have concept of data coming from address in memory, not just going into MBR) **Step 4:** Decode instruction; **A** Contents of CIR decoded **R** Data for instruction **R** CIR decoded, CIR decodes instruction **1 mark for each correct step** For PC accept Program Counter/SCR/Sequence Control Register For MAR accept Memory Address Register For MBR accept Memory Buffer Register/MDR/Memory Data Register For CIR accept Current Instruction Register/IR/Instruction Register **A** Other means of indicating correct transfer e.g. [PC]→MAR or MAR:=PC **A** Missing square brackets or alternative types of brackets **A** Answers that miss out reference to "contents of" **A** [Memory] for $[Memory]_{addressed}$	**3**
	(b)	(i)	Increases the number of bits (**A** amount of data) that can be transferred <u>at one time</u> // increase rate of data transfer;	**1**
		(ii)	Increases the number of memory addresses / /Increase the <u>maximum</u> amount of primary store/memory (possible);	**1**
		(iii)	<u>Instructions</u> performed more quickly // <u>Instructions</u> executed at faster rate; **A** Calculations for instructions (this time only) **A** Operations for instructions **NE** Speeds the computer up **R** Processes, tasks for instructions	**1**

8	(a)	Data that relate to a <u>living</u> person//individual who can be <u>identified</u> from that data; **NE Data that belongs to/relates to a person**	**1**

(b)
(c)

Principle	**Appropriate Feature**
Data must be accurate and up to date. **A** accurate without up to date or vice-versa (**A** correct for accurate)	Validation/examples of a validation method; Verification/example of a verification method; Store date when data last updated; Alert user when data is older than specified age;
Data must not be kept for longer than is necessary.	Records deleted automatically after no contact with customer for fixed period; Option to delete data;
Data must be processed in line with the rights of data subjects.	Option to flag customer as not accepting direct marketing; Option to edit or delete data; Option to print copy of all data for customer to see;
Data must be kept securely // Prevent unauthorised access/disclosure of data **NE** Hacking	Password/card/biometric to logon; Encryption; Backup; Different types of user/users have different rights; Automatic logoff if left unattended; Other appropriate security method;
Data must only be processed for registered/lawful purpose	Input of data subject preference with regard to use of/transfer of data; Restrictions on exporting data from package;
A Data must not be transferred to other countries without adequate protection.	Restrictions on exporting data from package;

1 mark for **principle**
1 mark for **naming feature** that is appropriate to the principle stated
1 mark for appropriate **explanation of how** the feature will help the company comply with the DPA
R Other DPA principles
MARK CAN BE AWARDED FOR PRINCIPLE IF NO FEATURE STATED OR IF FEATURE INAPPROPRIATE

3

9	(a)		Structure // Defining what components make up page // Specify page content **T/O** Any reference to appearance/layout of the page. **NE** Design	**1**
	(b)		Style/layout/presentation // Defining how different components will look // To ensure consistency of appearance between pages/across site **NE** Design **NE** Just examples of CSS	**1**
	(c)	(i)	Body/H1/P **R** Answers including any other code	**1**
		(ii)	Correct Statement : p {color:green; <new statement>} **1 mark** for correctly copying the existing p statement from the code given in the question and using a symbol to separate the color:green from new statement. <new statement> can come before or after color. **I** Errors in punctuation e.g. wrong separator symbol, wrong type of brackets, no brackets. **I** Minor spelling errors e.g. color as colour For <new statement> allow any of these correct alternatives for **1 mark**: font:bold font:bolder font-weight:bold font-weight:bolder font-weight:600 (allow 600,700,800 or 900) **I** Errors in punctuation, minor spelling errors. **R** Strong instead of bold **A** Variations on the correct command for bold as long as the meaning is clear	**2**

10	(a)	*Similarity:* Use same protocols **A** example eg. TCP/IP HTTP; Similar facilities available **A** example e.g. email, web site; Use of same software to access information **A** example e.g. web browser. Similar purpose – sharing information, improved communication; Both client/server systems; **NE** Both use protocols **NE** Both are networks *Difference:* Internet publicly available vs intranet only accessible within company/by employees/private; Internet use of public telecommunications network vs intranet may use private network; Intranet more secure than the Internet; **R** Need password for intranet **R** Global vs Local **MUST STATE BOTH SIDES OF DIFFERENCE** **MUST BE CLEAR THAT DIFFERENCE IS STATED THE CORRECT WAY ROUND**	**1** **1**

	(b)	(i)	Set of rules / agreed codes; Agreed standard for communication between computer systems;	**1**

(ii)

Layer	*Function*
Application	Gives applications access to the network; **A** Examples of applications
Transport/TCP	Provides reliability of transmission / check transmission successful; Error detection and correction / error handling **A** either detection or correction Acknowledgement of received packets; Retransmission of packets if required; Flow control / Congestion avoidance / congestion management; Packet sequencing; Adding TCP headers; Pass data to correct process in application layer; Allocation of port numbers; Divided data into packets / reassembling data from packets; Connection establishment/maintenance; Creation of virtual circuits;
Network/Internet/IP	Routing; Adds addressing info; Adds source and destination IP addresses;
Link/ Data Link/ Physical	Physical interface with medium/cable; Mapping of IP to MAC addresses; **A** Hardware address Conversion of IP datagrams to network frames; Adds Ethernet/MAC addresses; Adds header/trailer;

1 mark for each correct layer name
1 mark for each correct function associated with the correct layer

4

11	(a)	*What:* Access management system for digital media; Method of encrypting digital media; Media can only be read/used/accessed with correct key; *Why:* To enforce copyright law // Protect intellectual property; **A** Prevent criminal offence **R** Just illegal To stop people copying music (without permission)/prevent piracy/prevent illegal sharing/prevent illegal downloads; **R** stop reselling To ensure company/artist receives income from sales of music // does not lose money; **MAX 2 FOR WHAT, MAX 2 FOR WHY, MAX 3 OVERALL**	**3**

	(b)	Music/files are encrypted; **R** Encoded/Scrambled for encrypted User obtains key when purchases track/file; Music/files must be decrypted with key; **R** Password, Code Key may only work on computer file downloaded onto; **A** Playback tied to particular hardware device/group of devices **R** Files cannot be copied Key may need to be authenticated with server over Internet whenever file used // Company may have licence/key server; Time lock so music will not play after certain date // only play a fixed number of times; Use of a specific/proprietary program to play music; Usage rights may be expressed in a Rights Expression Language; **R** Streaming; **MAX 2**	**2**

12	(a)	Secondary store is non-volatile / stores a permanent copy / keeps contents when computer turned off whereas primary store is volatile / temporary / loses contents when computer turned off; Secondary store is not directly accessible to the processor / outside main memory whereas primary store is directly accessible to processor; Capacity of primary store is limited by width of address bus whereas no limit on capacity of secondary store; Data in primary store can be accessed more quickly than data in secondary store; **A** Answers where converse is implied rather than stated. **R** Secondary store is long-term whereas primary store is short-term. **R** Secondary store has a higher capacity than primary store.	**2**
	(b)	Magnetic (medium); Binary digits/bits/0s and 1s/data represented by magnetising spots on disk // changing magnetic properties of disk; Disk divided into tracks and sectors; **A** either tracks or sectors alone Drive head can move in/out // moves to track // moves radially Disk continually spinning; 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; May be multiple platters; **A** surfaces One head per platter; Use of cache/buffer to speed up data transfer; Medium and drive/device integrated // medium in sealed enclosure; Head parked / not over disk when not in use; **MUST USE ACCURATE TERMINOLOGY AS THIS IS THE QUALITY OF LANGUAGE QUESTION**	

Mark Bands and Description	
5-6	*To achieve a mark in this band, candidates must meet the subject criterion (SUB) and 4 of the 5 quality of language criteria (QLx).* *SUB* Candidate has provided a clear explanation of principles of operation, including at least 5 of the points listed above. *QL1* Text is legible. *QL2* There are few, if any, errors of spelling, punctuation and grammar. Meaning is clear. *QL3* The candidate has selected and used a form and style of writing appropriate to the purpose and has expressed ideas clearly and fluently. *QL4* Sentences and paragraphs follow on from one another clearly and coherently. *QL5* Appropriate specialist vocabulary has been used.

Mark Bands and Description	
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 (QLx).* *SUB* Candidate has provided a limited explanation of principles of operation, including at least 3 of the points listed above. *QL1* Text is legible. *QL2* There may be occasional errors of spelling, punctuation and grammar. Meaning is clear. *QL3* 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. *QL4* The candidate has used well-linked sentences and paragraphs. *QL5* Appropriate specialist vocabulary has been used.

Mark Bands and Description	
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 QLx statements.* *SUB* Candidate has provided a weak explanation which covers at least 1 of the points listed above for 1 mark or 2 points to get 2 marks. *QL1* Most of the text is legible. *QL2* There may be some errors of spelling, punctuation and grammar but it should still be possible to understand most of the response. *QL3* The candidate has used a form and style of writing which has many deficiencies. Ideas are not always clearly expressed. *QL4* Sentences and paragraphs may not always be well-

			connected or bullet points may have been used. *QL5* Specialist vocabulary has been used inappropriately or not at all.	
			0 Candidate has not made reference to any of the points listed above.	
		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 LANGUAGE CRITERIA THEN DROP MARK BY ONE BAND, PROVDING THAT AT LEAST 3 OF THE QUALITY OF LANGUAGE CRITERIA ARE MET IN THE LOWER BAND. IF 3 CRITERIA ARE NOT MET THEN DROP BY TWO BANDS.**	**6**