

# **Mark Scheme for June 2012**

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All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

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Question			Answer	Marks	Guidance
1	(a)	(i)	<ul style="list-style-type: none"> <li>ensure all jobs are processed/changing priorities where necessary</li> <li>process as many jobs as possible (in the least possible time)</li> <li>maximise number of interactive users...</li> <li>...receiving fast response times</li> <li>utilise resources/processor time efficiently</li> </ul>	4	Accept "to be fair to all users"
		(ii)	<ul style="list-style-type: none"> <li>each user allocated a time slice</li> <li>time slices are very small time/fractions of seconds</li> <li>at end of time slice, system moves to next user/job moves to back of queue</li> <li>repeat this for all users in turn</li> <li>order may depend on users' priorities</li> <li>users unaware of any delays</li> <li>pre-emptive scheduler</li> </ul>	4	Accept answers based on jobs instead of users
		(iii)	<ul style="list-style-type: none"> <li>first come, first served</li> <li>jobs processed in order of arrival</li> </ul> <p><i>or</i></p> <ul style="list-style-type: none"> <li>system of priorities</li> <li>highest priority first</li> </ul> <p><i>or</i></p> <ul style="list-style-type: none"> <li>length of job</li> <li>shortest job first</li> </ul>	2	for FCFS, accept FIFO if described accept other examples
	(b)	(i)	<ul style="list-style-type: none"> <li>an "order of importance"...</li> <li>as some jobs are needed more urgently than others</li> </ul>	2	
		(ii)	<ul style="list-style-type: none"> <li>to allow it to be processed</li> <li>otherwise if higher priority jobs keep occurring /it would have to wait indefinitely</li> </ul>	2	

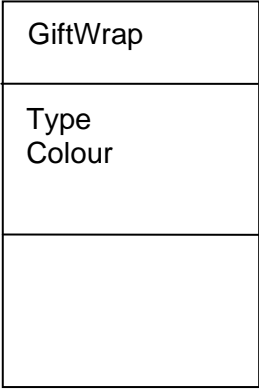
Question		Answer	Marks	Content	Guidance
					Levels of response
2	(a)	<p>Points to be made may include:</p> <p><i>interpreter:</i></p> <ul style="list-style-type: none"> <li>• translates one line/statement...</li> <li>• ...then runs it before translation of next line</li> <li>• reports one error...</li> <li>• ...then stops</li> <li>• indicates position of error</li> <li>• interpreter must be present each time program is run</li> <li>• program runs more slowly due to translation</li> <li>• virtual machine</li> <li>• used during program development</li> </ul> <p><i>compiler:</i></p> <ul style="list-style-type: none"> <li>• translates whole program as a unit...</li> <li>• ...and creates an executable program...</li> <li>• ...when program is completed</li> <li>• protects program from malicious use</li> <li>• architecture specific</li> <li>• may report a number of errors at once</li> <li>• some reported errors may be spurious</li> <li>• optimisation improves program speed/size</li> <li>• compiler is no longer needed once executable code is produced</li> </ul>	8		<p><b>Mark band 6-8, High level response</b> Candidate has described both of the terms in detail and made comparisons between them. The use of both translators has been addressed. Candidate has used appropriate technical terminology throughout. There are few, if any, spelling errors or grammatical errors.</p> <p><b>Mark band 3-5, Medium level response</b> Candidate has described both of the terms in detail, or described only one of the terms in detail but made some comparisons between them. Candidate has used some technical terminology in the response. There may be spelling errors or grammatical errors but they are not obtrusive.</p> <p><b>Mark band 0-2, Low level response</b> Candidate may have listed some relevant points but failed to describe the features or to make comparisons. There is lack of cohesion in the response. Candidate has failed to use correct technical terms in the response. Spelling and grammatical errors affect the readability of the response.</p>

Question			Answer	Marks	Guidance	
					Content	Levels of response
	(b)		<ul style="list-style-type: none"> <li>• can run on a variety of computers/devices...</li> <li>• ...using an interpreter</li> <li>• improves portability</li> <li>• to allow sections of program to be written in different languages</li> <li>• used in a virtual machine</li> </ul>	3		

Question			Answer	Marks	Guidance	
3	(a)	(i)	<ul style="list-style-type: none"> <li>• more than one processor...</li> <li>• working together/synchronised...</li> <li>• to perform a single job...</li> <li>• which is split into tasks</li> <li>• each task may be processed by any processor</li> <li>• processors are controlled by a complex operating system</li> </ul>	4		
		(ii)	<ul style="list-style-type: none"> <li>• a processor that allows the same instruction to operate simultaneously ...</li> <li>• ...on multiple data locations</li> <li>• using multiple ALUs</li> <li>• Single Instruction Multiple Data (SIMD)</li> <li>• the same calculation on multiple data is very fast</li> </ul>	3		
	(b)		<ul style="list-style-type: none"> <li>• a limited number of instructions is available</li> <li>• an instruction performs a simple task</li> <li>• complex tasks can only be performed by combining a number of instructions...</li> <li>• so a task may take a number of machine cycles</li> </ul>	2		

Question		Answer	Marks	Guidance
4	(a)	<ul style="list-style-type: none"> <li>exponent 1110 represents <math>-8+4+2 = -2</math></li> <li>mantissa 0.101, move point 2 places left so becomes 0.00101</li> <li>value is <math>\frac{1}{8} + \frac{1}{32} = \frac{5}{32}</math> (=0.15625)</li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>exponent 1110 represents <math>-8+4+2 = -2</math></li> <li>mantissa 0.101 = <math>\frac{5}{8}</math></li> <li>value is <math>\frac{5}{8}</math> multiplied by <math>2^{-2} = \frac{5}{32}</math></li> </ul>	3	
	(b)	<p>(answer is 0110 0101)</p> <ul style="list-style-type: none"> <li>24 in pure binary is 11000</li> <li>move point 5 places left, mantissa is 0.110</li> <li>exponent is 5 which is 0101</li> </ul>	3	accept other methods
	(c) (i)	<ul style="list-style-type: none"> <li>value is too large/out of range/exponent is too small</li> <li>maximum value stored is 0111 0111</li> <li>...which is 1110000. = 112</li> </ul>	2	
	(ii)	<ul style="list-style-type: none"> <li>value is 1.0001</li> <li>mantissa needed is 010001...</li> <li>which has 6 bits but only 4 are available...</li> <li>so exact value cannot be stored</li> </ul>	3	
5	(a)	<ul style="list-style-type: none"> <li>(i) static</li> <li>(ii) array</li> <li>(iii) amount of storage is known/easier to program</li> </ul>	3	[Max 1 per dotty] (ii) fixed length record
	(b) (i)	<ul style="list-style-type: none"> <li>pointers have same value/point to same location</li> </ul>	1	

Question		Answer	Marks	Guidance
	(ii)	<ul style="list-style-type: none"> <li>• check queue is not empty</li> <li>• if empty, report error <b>&amp; stop</b></li> <li>• read data(front)</li> <li>• increment front</li> </ul>	4	Preferred answer: IF FRONT = NEXT THEN STOP ELSE DATA = QUEUE(FRONT) FRONT = FRONT + 1
	(c)	<ul style="list-style-type: none"> <li>• 1<sup>st</sup> value added to queue...</li> <li>• ...<b>next</b> moved to front of data structure (circular queue)</li> <li>• 2<sup>nd</sup> value added at <b>next</b> and <b>next</b> incremented</li> <li>• test for queue full/<b>next=front-1</b>/report error</li> <li>• diagram showing 1<sup>st</sup> movement of <b>next</b> pointer</li> </ul>	5	accept use of flag for testing error report must be before attempting to add 3 <sup>rd</sup> data item
6	(i)	<ul style="list-style-type: none"> <li>• a class that has all the attributes &amp; operations of its superclass...</li> <li>• ...&amp; may have attributes &amp; operations of its own</li> <li>• eg an object of class Book has Price inherited from Product...</li> <li>• ...in addition to Title</li> </ul>	3	Attributes = properties Operations = methods = functions  accept other valid examples from the diagram
	(ii)	<p><i>thisBook.setTopic("Computing")</i></p> <ul style="list-style-type: none"> <li>• setTopic is an operation in NonFictionBook</li> </ul> <p><i>thisBook.findPrice</i></p> <ul style="list-style-type: none"> <li>• findPrice is an operation in Product...</li> <li>• ...which is the superclass for NonFictionBook</li> </ul>	3	

Question			Answer	Marks	Guidance
		(iii)	 <pre> classDiagram     class GiftWrap {         Type         Colour     }             </pre> <p>(this diagram added) marks for:</p> <ul style="list-style-type: none"> <li>• diagram added, with class name <b>GiftWrap</b></li> <li>• link showing correct inheritance from Product</li> <li>• Type &amp; Colour both in correct position only</li> </ul>	3	
7	(a)	(i)	<ul style="list-style-type: none"> <li>• block of code/set of instructions/subroutine/subprogram/module...</li> <li>• which performs a task</li> <li>• receives parameter values</li> <li>• uses local variables</li> <li>• may return value(s)</li> </ul>	4	
		(ii)	<ul style="list-style-type: none"> <li>• supplied to a procedure (or function)</li> <li>• pass values between functions/procedures</li> <li>• passed by reference...</li> <li>• ...or by value</li> <li>• used as a local variable</li> </ul>	3	



Question		Answer	Marks	Guidance
	(b)	(i) <code>&lt;code&gt; ::= &lt;char&gt;   &lt;char&gt; &lt;code&gt;</code> <i>marks for:</i> <ul style="list-style-type: none"> <li>• <code>&lt;code&gt; ::= &lt;char&gt;  </code></li> <li>• <code>&lt;char&gt; &lt;code&gt;</code></li> </ul> (ii) <code>&lt;comment&gt; ::= { }   { &lt;code&gt; }</code> <i>marks for:</i> <ul style="list-style-type: none"> <li>• <code>&lt;comment&gt; ::= { }  </code></li> <li>• <code>{&lt;code&gt;}</code></li> </ul> (iii) <code>&lt;statement&gt; ::= &lt;comment&gt;   &lt;code&gt;</code> <i>marks for:</i> <ul style="list-style-type: none"> <li>• <code>&lt;statement&gt; ::= &lt;comment&gt;  </code></li> <li>• <code>&lt;code&gt;</code></li> <li>• correct notation throughout (b)</li> </ul>	7	accept <code>&lt;code&gt; &lt;char&gt;</code>
8		(i) <ul style="list-style-type: none"> <li>• machine-oriented language</li> <li>• related to design of computer</li> <li>• includes assembly language/machine code</li> <li>• may use mnemonics (for operations)</li> <li>• may use labels (for addresses)</li> </ul>	3	
		(ii) <p><i>opcode:</i></p> <ul style="list-style-type: none"> <li>• (mnemonic part of instruction) indicating what it is to do</li> <li>• eg ADD</li> </ul> <p><i>operand:</i></p> <ul style="list-style-type: none"> <li>• address field in instruction/holds data or address to be used</li> <li>• eg 45</li> </ul>	4	

Question		Answer	Marks	Guidance
	(iii)	<p><i>immediate:</i></p> <ul style="list-style-type: none"> <li>• data in the operand is the value to be used by the operator</li> <li>• eg ADD 45 adds the value 45...</li> <li>• ...to the value in the accumulator</li> </ul>	3	
	(iv)	<p><i>direct:</i></p> <ul style="list-style-type: none"> <li>• uses data in operand as the address of the data</li> <li>• eg ADD 45 uses the contents of address 45...</li> <li>• ...and adds it to the value in the accumulator</li> </ul>	3	
9	(a)	(i) <ul style="list-style-type: none"> <li>• reduces data duplication/reduces data redundancy/saves storage</li> <li>• improves data consistency</li> <li>• easier to change data/data format</li> <li>• data can be added more easily</li> <li>• improves data integrity/improves data security</li> <li>• control access to data/levels of security</li> </ul>	3	
		(ii) <ul style="list-style-type: none"> <li>• eg list of names &amp; addresses for personal use on home computer</li> <li>• simple data structure/easy to maintain/only small amount of data stored</li> </ul>	2	accept other valid examples
	(b)	(i) <ul style="list-style-type: none"> <li>• Structured Query Language</li> </ul>	1	do not accept SQL accept Data Manipulation Language
		(ii) <ul style="list-style-type: none"> <li>• restricts user access to data (relevant for their job)</li> <li>• to provide access to data needed</li> <li>• user does not need technical expertise</li> </ul>	2	
		(iii) <ul style="list-style-type: none"> <li>• provides a view of data called SOME_DATA</li> <li>• lists only the attributes StaffId, Surname, &amp; Department from the STAFF table</li> <li>• whose start date is before 2010</li> </ul>	3	

Question		Answer	Marks	Guidance
10	(a)	<ul style="list-style-type: none"> <li>• ShootId in PHOTO...</li> <li>• ...is an attribute in PHOTO...</li> <li>• ...&amp; is the primary key from PHOTOSHOOT</li> <li>• used to provide a relationship/link between PHOTO &amp; PHOTOSHOOT</li> </ul>	3	accept photoID in SALE
	(b)	<p>1 mark for each correct "end" of relationships</p>	4	
	(c)	<ul style="list-style-type: none"> <li>• CUSTOMER</li> <li>• so customers may be contacted/customer details may be kept</li> <li>• CustomerId</li> <li>• Name/Address/PhoneNumber/Email</li> </ul> <p>or if many-many relationship shown in (b),</p> <ul style="list-style-type: none"> <li>• named link entity in correct place</li> <li>• used to resolve many-many relationship/to give 3NF</li> <li>• composite primary key identified</li> <li>• sensible attribute given (not already in question)</li> </ul>	4	accept alternative relevant examples
	(d)	<ul style="list-style-type: none"> <li>• Location/Date/StartTime</li> <li>• allows the table to be sorted...</li> <li>• allows the table to be searched...</li> <li>• ...differently from the primary key</li> <li>• explanation relevant to example given</li> </ul>	4	

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