MINISTRY OF EDUCATION, SINGAPORE
in collaboration with
UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE
General Certificate of Education Advanced Level
Higher 2

COMPUTING

9569/01

Paper 1

For Examination from 2020

SPECIMEN MARKING GUIDE FOR TEACHERS

3 hours

MAXIMUM MARK: 100

This document consists of **11** printed pages and **1** blank page.

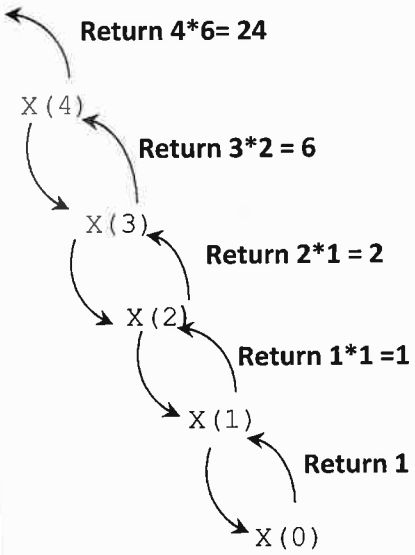
Singapore Examinations and Assessment Board

CAMBRIDGE International Examinations

[Turn over

Where responses in addition to those given in the marking guide are possible, full marks will be given for a correct response, with equivalent sub-marks for equivalent stages. (This does not however apply if candidates are directed in the question to answer a question in a particular way.)

Question	Answer	Marks
1(a)(i)	Any **three** from: Use the number of records to find the middle record Check if the value of the `TVNumber` searched for is larger, equal to or smaller than the `TVNumber` of the middle record If greater than repeat with the half of the list containing the smaller numbers and if smaller than repeat with the half of the list containing the larger numbers Repeat until record is found, `TVNumber` is equal to `TVNumber` of the middle record or list cannot be further subdivided Accept a flowchart or pseudocode if also followed with an **explanation**.	**3**
1(a)(ii)	Any **three** from: Use the number of records to find the length of the list Start with the first record If equal – record is found or if not equal move to next record Repeat until record is found or the end of the list is reached. Accept a flowchart or pseudocode if also followed with an **explanation**.	**3**
1(a)(iii)	Binary search is more efficient With a worst case performance O(log n) A linear search has a worst case performance of O(n)	**3**
1(b)	92 41 and 43	**2**
1(c)(i)	23, 17, 45, 3, 7 45, 23, 17, 3, 7 45, 23, 17, 7, 3	**3**
1(c)(ii)	Compare adjacent elements in the list; swap if in the wrong order Repeat the process until no swaps are made 23 45 17 7 3 45 23 17 7 3	**4**

Question	Answer	Marks
2(a)	Any **two** from: A function that is defined in terms of itself A function that calls itself with one or more similar but smaller problems A function that can repeat itself several times until one or more terminating case(s) is reached	**2**
2(b)	06	**1**
2(c)	Correct return value from X(2) to X(3) Correct return value from X(3) to X(4) Correct return value for X(4) i.e. 24 Showing correct working on the left side of '=' sign for all iterations  	**4**
2(d)	Finds the factorial of `Index`	**1**
2(e)	Does not terminate for negative numbers	**1**

Question	Answer	Marks
3(a)	 *Mark as follows:* Correct root Ryan 18 Correct nodes, Bella 21 and Joshua 27 Correct terminal nodes, Shane 20, Jasmine 18 and Alexis 27 Correct pointers	**4**
3(b)(i)	One 2-D array with 4 columns // Four 1-D arrays // Two 2-D arrays with 2 columns Use of Array(s) for Name, Age … … Left Pointer and Right Pointer The value –1 is used for the null pointers on the terminal nodes	**4**

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>3(b)(ii)</td><td>
<table>
<tr><th>Index</th><th>Name</th><th>Age</th><th>Left Pointer</th><th>Right Pointer</th></tr>
<tr><td>0</td><td>Ryan</td><td>18</td><td>1</td><td>3</td></tr>
<tr><td>1</td><td>Bella</td><td>21</td><td>5</td><td>2</td></tr>
<tr><td>2</td><td>Joshua</td><td>27</td><td>4</td><td>–1</td></tr>
<tr><td>3</td><td>Shane</td><td>20</td><td>–1</td><td>–1</td></tr>
<tr><td>4</td><td>Jasmine</td><td>18</td><td>–1</td><td>–1</td></tr>
<tr><td>5</td><td>Alexis</td><td>27</td><td>–1</td><td>–1</td></tr>
</table>
Correct data
Correct pointers</td><td>2</td></tr>
<tr><td>3(c)(i)</td><td>Perform a binary search …
Starting from the root of the binary search tree</td><td>2</td></tr>
<tr><td>3(c)(ii)</td><td>Any six from:
Perform an in-order tree traversal by starting at the root node, Ryan
Visit each node once by recursively visiting each left sub-tree, starting with Bella then Alexis
Select the node that is at the end of left sub-tree (left pointer is null), Alexis
Select the sub-tree root, Bella
Move to the right sub-tree and repeat, selecting Jasmine then Joshua
Select the sub-root further up the tree and repeat until the root, Ryan is selected
Repeat using the right sub-tree selecting Shane
Accept a flowchart or pseudocode if also followed with an explanation.</td><td>6</td></tr>
</table>

Question	Answer	Marks
4(a)		4

		Rules							
Conditions	Amount <= balance	Y	Y	Y	Y	N	N	N	N
	Amount <= withdrawal limit on account	Y	Y	N	N	Y	Y	N	N
	Amount <= cash in machine	Y	N	Y	N	Y	N	Y	N
Actions	Dispense cash	X							
	Cancel transaction			X	X	X	X	X	X
	Offer amount available		X						

Mark as follows:
two marks for matching condition rules
(one error – one mark, two or more errors no marks)
two marks for matching action rules
(one error – one mark, two or more errors no marks)

Question	Answer	Marks
4(b)		2

		Rules			
Conditions	Amount <= balance	Y	Y	Y	N
	Amount <= withdrawal limit on account	Y	Y	N	–
	Amount <= cash in machine	Y	N	–	–
Actions	Dispense cash	X			
	Cancel transaction			X	X
	Offer amount available		X		

Mark as follows:
Reduction for account balance N
Reduction for withdrawal limit N

Question	Answer	Marks

4(c)	`OUTPUT "Please enter the amount of money to withdraw "`
	`INPUT Amount`
	`IF Amount <= AccBal AND Amount <= WithLmt AND Amount <= AmntATM`
	`  THEN`
	`  OUTPUT "Cash will be dispensed"`
	`ENDIF`
	`IF Amount > AccBal`
	`  THEN`
	`  OUTPUT "Account balance exceeded"`
	`  ELSE`
	`  IF Amount > WithLmt`
	`  THEN`
	`  OUTPUT "Withdrawal limit exceeded"`
	`  ELSE`
	`  IF Amount > AmntATM`
	`  THEN`
	`  OUTPUT "ATM can only dispense ", AmntATM`
	`  ENDIF`
	`  ENDIF`
	`ENDIF`
	
	Mark as follows:
	Input `Amount`
	Checking `Amount <= AccBal`
	Checking `Amount <= WithLmt`
	Checking `Amount <= AmntATM`
	If all three conditions true …
	… output 'Cash will be dispensed' message
	If `AccBal` condition false output 'Account balance exceeded' message
	If `WithLmt` condition false output 'Withdrawal limit exceeded' message
	If `AmntATM` condition false output 'ATM can only dispense' message …
	… and `AmntATM`
		10

Question	Answer	Marks
5(a)(i)	 *Mark as follows:* `Customer` [1] `Booking` [1] `Apartment` [1] `ApartmentRate` [1] 1 mark per relationship [3]	**7**

Question	Answer	Marks

5(a)(ii)	*Example:*
	`Customer (CustomerRef, CustName, CustAddress)`
	`Apartment (ApartmentNumber, ApartmentType)`
	`ApartmentRate (ApartmentType, TypeDayRent)`
	`Booking (CustomerRef, DateBooked, StartDate, CompletionDate, ApartmentNumber, Deposit)`
	
	Mark as follows:
	Primary keys shown for:
	`Customer` table – `CustomerRef` [1]
	`Apartment` table – `ApartmentNumber` [1]
	`ApartmentRate` table – `ApartmentType` [1]
	`Booking` – `ApartmentNumber` + `StartDate` [1]
	`Booking` includes:
	`Deposit` [1]
	All three dates [1]
	Foreign keys shown for:
	`ApartmentType` in table `Apartment`
	`CustomerRef` in table `Booking`
	`ApartmentNumber` in table `Booking` [1]
		7

5(a)(iii)	*Mark as follows:* ***three*** *correct explanations 2 marks,* ***two*** *correct explanations 1 mark:* `ApartmentType` in table `Apartment` ensures that each apartment is associated with a valid apartment type `CustomerRef` in table `Booking` ensures that each booking is associated with a valid customer name and address `ApartmentNumber` in table `Booking` ensures that a valid apartment is assigned to each booking	2
5(b)	Any **three** from: Extra data requirements not clear or consistent Flexibility – new fields can be easily added without making changes to existing schema Ease of access to all the data stored about a single apartment Better performance speed for simple queries	3

Question	Answer	Marks
6(a)	Mark as follows for each threat: One mark for the description of a threat applied to the company One mark for the effect on the company One mark for describing how the company could protect against the identified threat One mark for identifying a limitation of the protection Malware can be introduced e.g. worm, virus etc. software that deliberately causes harm to data or software held on the computer servers most can be prevented by a firewall that monitors and controls network traffic based on rules set by the company Firewalls can be bypassed by the use of a VPN tool to log on Denial of service attacks that flood the servers with requests so that the system becomes overloaded and the servers are no longer available to company employees intrusion detection systems monitor suspicious network activity Intrusion detection systems provide alarms in time for network administrator to take further protective actions Intrusion detection systems can provide many false alarms	8
6(b)	2 marks for each reason Encryption Any data intercepted would not be understandable without the decryption key Use of a digital signature To ensure that any messages sent are authentic Use of authentication To ensure that the recipient is indeed the intended person	6

Question	Answer	Marks
7(a)	*Mark as follows:* One mark for a sample rule from each area * rules from Singapore Computer Society (SCS) professional code of conduct Sample Rules* – Integrity not lay claim to a level of competence that they do not possess act with complete discretion when entrusted with confidential information be impartial when giving advice and will disclose any relevant personal interests give credit for work done by others where credit is due Sample Rules* – Responsibility accept full responsibility for their work carry out their assignments in a professional manner adhere to their employers' or client's standards and guidelines indicate to their employers or clients the consequences to be expected if their professional judgement is overruled Sample Rules* – Competence always aim to increase their competence continue to upgrade their knowledge and skills, and be aware of relevant development in the technology they are involved in provide opportunity and encouragement for professional development and advancement to fellow professionals and aspirants to the profession extend public knowledge, understanding and appreciation of information technology and to oppose false or deceptive statements related to information technology of which they are aware Sample Rules* – Professionalism act with professionalism to enhance the prestige of the profession act with professionalism to enhance the prestige of the company	4
7(b)	Any **two** correct examples: not lay claim to a level of competence that they do not possess- an employee claims to be able to program in a language they have never used accept full responsibility for their work – when testing not to blame another colleague for missing an area they were supposed to test	2