Cambridge Assessment International Education

Cambridge International AS & A Level

INFORMATION TECHNOLOGY **9626/31**

Paper 3 Advanced Theory **May/June 2022**

MARK SCHEME

Maximum Mark: 70

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the May/June 2022 series for most Cambridge IGCSE, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

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Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:
Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:
Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:
Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:
Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:
Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:
Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Question	Answer	Marks
1(a)	**Five** from: Accidental deletion of files which are not backed up/have no other copies available Malware/viruses can automatically delete/damage/amend data Mechanical failure of storage systems/hard disks so that data cannot be retrieved Magnetic/electromagnetic failure/interference with hard disk surfaces leading to loss of sectors Power failure/loss/switch off during use of file/unsaved file resulting in corruption of data/data lost from memory buffers Theft of storage devices/computing devices resulting in physical loss of data/files Physical damage of computing devices by user/dropping/liquid spillage onto device prevents access to data Loss/damage to devices through natural disaster/fire/flood/water damage prevents access to data.	**5**
1(b)	**Three** from: Make copies/backups of the data regularly Automate the backup making process Save the copies/backups on different media Have a rolling backup strategy where media is reused at intervals Implement an incremental/differential/full backup system Keep accurate records of backups Store the copies/backups in remote locations/away from the originals/other backups/copies Test the restore process periodically.	**3**

Question	Answer	Marks
2	*Evaluate: judge the importance/quality of something* **Eight** *from:* Acts as intermediary/gateway between network clients and external websites so websites cannot log/record individual client activities Website cannot log/record/monitor individual client IP address so cannot determine (geo)location of client Website cannot log/record/monitor individual client IP address so cannot access data about client and provide some cybersecurity Can be used to control access to specified web sites so can filter out undesirable websites from clients to protect students from inappropriate web sites/information Can be used to cache frequently used/popular websites to provide a local store of pages so access times are reduced for individual clients Can be used to record IP address/user account of client/individual accessing the internet so provide a log/accountability/history of student accesses Can encrypt web requests from clients to prevent unauthorised access to details Can provide VPN services for remote access to school resources by students/parents/staff Can be used to hide IP addresses of client devices on LAN to attempt to reduce potential malicious attacks/translate client IPs to a single IP to share one internet IP address/single internet connection Proxy server holds data about individual/client IP address so if accessed by unauthorised users can reveal data/information about user habits/accounts/web accesses Access to websites can be slower as all requests have to pass through the server and this may impact upon e.g. video streaming Caches of websites stored on proxy server may be outdated so user may receive out-of-date information/have to wait until cache is refreshed User may not be aware that cache is out of date so may rely on old data.	**8**

Question	Answer	Marks
3(a)	**Four** from: Format is open-source/royalty-free so can be used without seeking permission of owner/creator/anyone/W3C (World Wide Web Consortium) Format is text-based/based on XML which is (now) standard for use on web pages so can easily be used by companies Format can (easily) be imported into many graphics manipulation software so is transferable between computer platforms/applications Format is scripting so can be included/used with CCS/scripting/animations so works well on web pages/sites Format is supported by web/print systems/mobile devices so no need to convert which might produce differences in appearance No compression is applied to the image so no compromising of the image quality occurs Use of XML/text/instructions/mathematical calculations means that image can be scaled/resize/zoom without change/loss of quality.	**4**
3(b)	**Four** from: The shape(s) that is/are to be drawn The dimensions of the shape to be drawn The dimensions/parameters of the lines to be drawn The style of the lines to be used The position on screen of the shape The colours to be used for the lines The colours of the fill of the shape(s) The text style/font to be used.	**4**

Question	Answer	Marks
4	*Discuss: write about a topic in depth in a structured way.* **Max 1** for good description of online tutorial. **Eight** from e.g.: *Advantages:* Students can have access to teachers/tutors that they would not otherwise be able to contact so they have a greater range of expertise to draw upon in their studies Students can access the tutorial at anytime that is convenient so can study as and when they wish Students and teachers do not have to be online at the same time so there are less time constraints on the interaction between students and teachers Students can access material without having to travel so there are no geographical constraints on where they study from or from where they take courses Students can share their studies/ideas/learning with a group without having to physically be together/have a teacher present Tutorials can be recorded for access at any time/can be replayed to review work Tutorial material can be studied in any order so students can choose what they study Students can get instant feedback from periodic pre-set tests/tasks *Disadvantages:* A reliable internet connection/suitable computing devices is/are required to access the tutorial without which there is a digital divide to overcome Tutorial may not be at the appropriate level for an individual student so some may be disadvantaged Lack of a teacher may result in loss of motivation by student so work is not completed/of low standard Lack of guidance through material may result in student missing important material in the study Teacher feedback may not be fast enough to resolve problems in the studies/task. *Must have at least two from each for full marks.* *Must be a proper discussion for full marks.* *Max 6 marks if bullets/list of points.*	**8**

Question	Answer	Marks
5	*Discuss: write about a topic in depth in a structured way.* **Eight** from: e.g.: E-waste includes all components of devices/CPUs/power supplies/chips/wires which have to be discarded/recycled somewhere E-waste produces/contains harmful chemicals/compounds/metals that can end up in the environment ... e.g. lead/cadmium/mercury/beryllium/brominated flame retardants/Polyvinyl chloride (PVC)/Perfluorooctanoic acid (PFOA) E-waste produces/contains (other) substances which can get into environment ...e.g. aluminium/copper/germanium/gold/lithium/nickel/silicon/tin/zinc Recycling of harmful substances can pose significant risk to health of workers involved in the recycling/disposal resulting in their sickness/early death CRTs from monitors release lead/barium/phosphor into environment if broken/dumped PCBs release glass/tin/lead/dioxins/beryllium/cadmium when de-soldered/stripped by burning Computer chips release heavy metals when burnt/stripped by acid baths which pose a health hazard Plastics are released when cables/wires are stripped to recover metals/dumped into land fill and seep into the water system Plastics are released when cases/keyboards are broken up to recover metals/dumped into landfill Emission of fumes/compounds when burned into environment can affect air quality and have detrimental effect on health Effect on water quality can affect humans/wildlife/plant life E-waste pollutants can get into human food chain and affect people all over the world Need to increase the recycling of complete electronic devices to reduce pollution Need to recycle components safely to avoid hazardous substances being released Updating to new systems can use less energy/total cost of ownership. *Must have at least two from each for full marks.* *Must be a proper discussion for full marks.* *Max 6 marks if bullets/list of points.*	**8**

Question	Answer	Marks
6(a)	**Two** from: (Data mining is) the process of analysing a large quantity of data/information Used to discern/discover/show trends Used to discern/discover/show patterns.	**2**
6(b)	**Six** from: Divide customers into groups according to purchasing habits Customer groups include e.g. recency/frequency/monetary (RFM) groups Customers in the different groups are targeted by different marketing campaigns E.g. recent buyers sent money-off coupons with time limit/frequent customers sent coupons off regular purchases/suggestions for additional purchases/big spenders dealt with differently from those who spend little at a time Can decide when to put items on sale/at full price Can target specific customers/customer groupings from customers purchasing habits via social media/email marketing Can target specific customers/customer groupings from loyalty card schemes via social media/email marketing Can decide which advertising campaigns worked/which did not Can decide which items sold well to different demographics/which did not.	**6**

Question	Answer	Marks
7(a)	**Four** from: Background/non-moving objects drawn on one cell and placed at bottom of stack of cells Character to be moved drawn on transparent cell (Transparent cell) placed on top of background and photographed/digitised Character redrawn as moved (on transparent cell) and replaced Re-photographed/digitised in next frame Process repeated for subsequent frames.	**4**

Question	Answer	Marks
7(b)	**Four** from: Scene/characters arranged and lighted/lit Camera/computer app/software setup Frame recorded/photographed Frame checked/viewed for corrections/deleted if not required Characters/objects moved slightly and re-photographed into new frame Use of 'onion-skinning'/faint outline of previous frame in software/app to show placement of characters/objects Frames duplicated (in app/software) to slow the motion down e.g. when character changes direction suddenly.	**4**
8(a)	**Two** from: Converts characters to same type if necessary Then compares values to determine if strictly equal/have same sequence of characters, same length, and same characters in corresponding positions/same value Returns TRUE if the same Returns FALSE if not the same.	**2**
8(b)	**Two** from: Compares (both) type and value Returns TRUE if of the same value and different type Returns TRUE if of the same type and different value Returns FALSE if same type AND value.	**2**

Question	Answer	Marks
9(a)	**Four** from: Specify the criteria for developing/creating the new DBMS Provide clear instructions/guidance for the developers of the new DBMS Specify how the new system will meet user requirements Form part of a patent application for the design/product Form basis of accurate costings/resource allocation for product/DBMS development Be part of a legal contract between client and developers.	**4**
9(b)	**Six** from: An introduction to the document stating its purpose for designing the DBMS A description of the intended audience of the design specification document An identification of the intended product using its names and references A summary of the contents of the document An overview of the DBMS system to be designed with its intended functions A discussion the constraints that affect the development such as use of distributed data/use of exiting modules The relationship between the data elements/modules of the database Description of the file requirements e.g. file/file access methods/list of fields within a record/data attributes/expected number of records Description of the purpose of calculations to be included Description of formulas and calculations to be used Description of error handling requirements/procedures Description of backup/recovery procedures/processes System start-up and shutdown procedures/processes Input checks performed/validation methods Description of error messages produced from invalid input Layout of report such as data contained in each field of each report Security design such as description of access control mechanisms/audit log provisions/user authentication/encryption processes.	**6**