Cambridge Assessment International Education

Cambridge International AS & A Level

INFORMATION TECHNOLOGY **9626/32**

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)	**Two** from: An app running on (a mobile device/smartphone) Stores debit/credit card information/digital currency/electronic money Allows payment for goods/services (digitally) Enables/allows contactless payments/uses NFC technology.	**2**
1(b)	**Four** from: User downloads/installs app (from (finance) provider) User registers with (finance) provider on/via app User inputs phone number Provider sends user a verification code via SMS/text message User authenticates number when receiving verification code User inputs debit/credit card information/data/payment details/adds account details Allows linking to bank account User validates/authenticates payment details.	**4**

Question	Answer	Marks
2(a)	**Two** from: Reduction in file size/to reduce the file size… to make it fit in available/take up less space on storage device (Reduction in file size) to allow transmission in email (Reduction in file size) to allow faster download to webpage/loading of webpages Reduction in image resolution for display on small screen/mobile devices Glitch art can make use of compression artefacts to alter images/JPEGs for artistic displays/picture style.	**2**

Question	Answer	Marks
2(b)	**Six** from: Loss of image data has a visible effect on quality of image/image quality is reduced Compression artefacts are produced during process of compression/by compression algorithm Compression artefacts can be visible/noticeable and detract from/reduce image quality Sudden changes in colour/brightness/contrast in an image can cause rings/bands/ghosts can appear near the edges Conversion of a gradation in tone by loss of data into fewer tones causes blocking/posterisation/checker-boarding to occur False edges may be created/(false) contouring due to reduction of grey levels/reduction to less than 16 grey levels in image so more edges appear to viewer Loss of data in curves/combining curve data/pixels during compression can lead to the curve appearing stepped/stair-cased and not as a smooth curve (Degradation in quality due to) changes/reduction colour depth/saturation/hue Reduction in resolution Compression algorithms can mistake text in images and change the meaning e.g. 6 mistaken for 8.	**6**

Question	Answer	Marks
3(a)	**Two** from: Correcting a problem/issue in the system After the system has already broken down/failed/not working properly Restoring the functioning/operability of the system by replacing components/adjusting code.	**2**

Question	Answer	Marks
3(b)	**Three** from: Diagnosing the problem (by testing the systems modules/components) Ask users for/gather information about the error/problem Identifying the problem/error/fault in the system Removing the faulty component/isolating the faulty code/module Replacing the faulty component with a new one (and testing it) Updating/amending the faulty/problematic software code/module Check for and removing viruses/malware/uninstalling harmful programs Reformatting storage devices and perform a system restore Refer to technical documentation. Take notes/make a report for reference Retest the system at end of process.	**3**

Question	Answer	Marks
4(a)	**Two** from: (Provides OK (button)) to indicate acceptance/verified by the user of choice (Provides Cancel (button)) to indicate rejection by the user of choice Provides a message specified by programmer to explain the choices available/question asked by programmer Provides (in some browsers) a Close (X) (button) on the top right of the box which may act as a cancel button.	**2**
4(b)	**Three** from: User is forced to look at/interpret/read the message/attention drawn away from main web page display causing user to lose concentration on page content Input focus is taken away from the web site/pages until box is closed so no other user interaction is possible/creates a modal window Other codes may stop running/functioning until the dialogue box is closed causing errors/interruptions to web page/code/ user interactions Position of dialog box cannot be controlled by programmer so may block information on page Some browsers may not (properly) support all of the elements of the dialogue box so some actions may not be possible.	**3**

Question	Answer	Marks
4(c)	**Three** from: Return value will be stored in a declared variable Return value is Boolean/either-or/one of two values If user clicks/chooses OK then TRUE is returned to the variable If user clicks cancel/close then FALSE is returned to the variable Result in variable can be used to display appropriate message depending on choice by user.	**3**

Question	Answer	Marks
5(a)	**Six** from: Supports the transport of data at high speeds through networks Is a connectionless service so each data packet passing through the network contains address information Allows use of virtual circuits which can appear permanent to users Allows multiplexing of virtual circuits to share network load/bandwidth Can only detect errors at the data link layer so there is no flow control/error control Faulty/damaged frames are dropped and there is no request for retransmission Supports variable frame sizes/data packets to accommodate different data requirements Operates at physical and data link layers so can be used for internet/broadband/ISDN connections There is no error control so it requires a reliable medium for transmission.	**6**
5(b)	**Three** from: Frames are delivered unreliably so have to be retransmitted if sender is aware of need/sender responsibility to resend Frames/data may go missing as there is no acknowledgement of received packets Packets may not be delivered in the same sequence as when sent No flow control so cannot stop data transmission when network is congested so data can be lost Frames are discarded when the network is congested Frame/data is lost if retransmission of this frame does not occur.	**3**

Question	Answer	Marks
6	*Discuss: write about issue(s) or topic(s) in depth in a structured way.* **Max 1** for good description of parallel running method of implementation **Six** from: *Benefits:* Can compare results from existing hardware/software/system …to ensure that there are no errors Can refer to/use existing hardware/software/system for reference if errors occur …so that the errors can be rectified Existing hardware/software/system can be used while errors/problems in new are rectified …so that production is not stopped/can continue Staff can be trained on new hardware/software/system while referring to existing hardware/software/system …so that staff confidence can be maintained/improved *Drawbacks:* Costs of parallel running can be high as two sets of hardware/software/system have to be run at the same time …requiring more power use/staff to run both sets of hardware/software/system Staff may need to do twice normal workload to run two sets of hardware/software/system …so production may slow down Maintenance time/effort is increased as there is two sets of hardware/software/system …this may slow production/increase costs Requirement to input data/instructions twice which increases data entry costs/production costs/slows production time Need to ensure accurate input of same data to ensure comparable results from both sets of hardware/software/system. *Must have at least one of each for full marks.* *Must be a proper discussion for full marks.* *Max 4 marks if bullets/list of points.*	**6**

Question	Answer	Marks
7	**Eight** from: *Discuss: write about issues(s) or topic(s) in depth in a structured way.* *Positive Impacts:* Training is more accessible to students/learners as can be used when and where convenient to student/available at anytime Delivery of small amounts of information in a step-by-step manner prompts students/learners to respond to a lesson at intervals/take brief tests regularly Provides students/learners with regular/instant/quicker feedback on their responses/overall progress increasing engagement and achievement/retention of knowledge/skills Allows students/learners to take courses at their own pace without need for/pressure to keep up with/wait for peers Sets learning prerequisites for moving on to/in readiness for the next lesson/section/topic Can track progress more accurately/can set individual targets Course information is easily/readily available/retrievable for later reference *Negative impacts:* Reduced human interaction with teachers/instructors so discussion is more difficult Reduced human interaction with fellow students/learners so reduced groupwork/discussions/assistance Teachers/instructors may not always be available when students require assistance Students/learners with low motivation will fall behind in their studies Without per/class discussions some students will be confused/not understand fully Slow /poor internet connections/older computing devices/power fluctuations may not allow easy access to course materials *Must be at least two of each for full marks.* *Must be a proper discussion for full marks.* *Max 6 marks if bullets/list of points.*	**8**

Question	Answer	Marks
8	**Four** from: Mail server provides email services to email client Email client sends request to server Server sends a response to email client Email client/app/reader/mail user agent/mail transfer agent/web mail logs into mail server Rules and language for requests/responses are determined by protocols/SMTP/IMAP/POP3 Messages are transferred between client and server/emails stored on server.	**4**

Question	Answer	Marks
9	*Analyse: examine in detail to show meaning, identify elements and the relationship between them.* Max **two** from: Method of scheduling tasks in a project Used to determine longest path/route through a project/how quickly a project can be completed **Eight** from: Reduces the risk of delays by involving all managers in details of planning so all are aware of the overall project details Allows resources required for each activity to be made available at the appropriate time which reduces costs Task/activities can be scheduled in parallel/simultaneously to reduce overall duration of project Determines/shows the dependencies of the activities/tasks… …so focus can be on the critical ones to improve chances of project success/activities that are required before others can start can be prioritised Use of 'floats' in timings can accommodate/allow for unexpected delays/minimise effect of unexpected external factors Complex activities/tasks are difficult to represent on a network diagram/diagram becomes very large and difficult to comprehend easily Charts/diagrams for large projects may be difficult to access easily away from office computers/on mobile devices External factors may change so the critical path analysis has to be redone/amended/may no longer apply Relies on estimates of task/activity duration so whole process can be invalid if estimates are wrong/inaccurate Resource details are limited so other methods of charting resources need to be used.	**8**

Question	Answer	Marks
10(a)	**Four** from: Gathering the data required for the phase Documenting/describing the data e.g. location of source/how acquired Listing the source of the data that has been gathered Populate the analysis tool/software with the data Reviewing/exploring the data to check for e.g. completeness/anomalies/outliers (Visually) checking the data for patterns/trends/groupings within the data set(s) Verifying the quality of the data that has been gathered.	**4**
10(b)	**Three** from: Planning how the data mining results will be used/reported Creating a plan to monitor/maintain the model to ensure it remains valid/useful Applying the data model/process to new data to generate predictions/trends/analysis as required by business Reporting the final results of the data mining process Reviewing the final results of the data mining process to check for errors and how to correct them.	**4**