Cambridge Assessment International Education

Cambridge International AS & A Level

INFORMATION TECHNOLOGY **9626/31**

Paper 3 Advanced Theory **October/November 2021**

MARK SCHEME

Maximum Mark: 90

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 October/November 2021 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

This document consists of **9** printed pages.

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)	**Eight** from: Drop down lists offering a choice to respondent Radio buttons allowing only one choice to be made Text boxes to gather free response answers/comments Single character boxes to ensure data entry is appropriate Validation rules to ensure that only reasonable data/comments/information is/are collected Validation rules place a limit on the number of characters in text boxes/in open-ended answers Inclusion of instructions/help/FAQs available to assist in completing the form Pop-up boxes to explain questions in more detail Multi-lingual options for different languages Branching logic to route participants around questions that do not apply to them Progress bar so participants can see how far they have got in the questionnaire Automatic survey/questionnaire expiry to set an end date for responses Can re-direct to end-of survey URL/web page Integration of answers from previous questions into new specific questions Real-time survey results can be shown to participants Results in the form of a graph can be displayed at the end of the survey/use of questionnaire Can send customised email(s) to participants to remind them/as a 'thank you'/incomplete questionnaire alert Can send report (for analysis) on survey/use of questionnaire/answers to specific questions to customised list of personnel Can include a 'forward to' option so that participants can send the questionnaire link to others Can be set up to prevent multiple responses/place a limit on responses from the same participants Can include an opt-out option so that participants are not repeatedly invited to complete the questionnaire(s).	**8**
1(b)	**Two** from: Sample of respondents can be too small to provide meaningful results/statistics Sample of respondents may not be representative of customers/not all customers will respond No interviewer involved so no 'follow-up' questions possible Customers may not give honest answers if invited by email with incentives (e.g. free sample/discount when responding) Difficult to check that a respondent is a genuine customer Only customers with internet access can be questioned.	**2**

Question	Answer	Marks
2(a)	**Five** from: Positional elements consisting of three (distinct) squares at corners to enable reader to align with the QR code Small square (at fourth corner) to enable reader/processor to calibrate image for size/orientation/angle when viewed Error correction keys stored as dots in QR code Version/format information stored as dots near to positional elements to allow reader/processor to choose decoding algorithm Timing information stored as dots between positional elements to assist with calibration Dots placed throughout the QR code store information in binary form White/'quiet' area around code to separate code from background.	**5**
2(b)	**Three** from: Error correction is used to compensate for missing/unreadable information Information is duplicated within the QR code so if one set of data is missing/damaged other sets can be read Code blocks can be interleaved with each other so that localised damage is less likely to lose information Use of multiple error correction blocks to ensure data can be read from larger QR codes Block size is limited by design/deliberately so that errors can be corrected quickly by less complex algorithms Masking patterns are designed to break up blocks of data/placed in zigzag patterns so that reader/processor is not confused.	**3**

Question	Answer	Marks
3(a)	**Six** from: Peers/nodes share/partition workloads/processing power without the need for a central server Nodes work as both client and server for other nodes Nodes can connect randomly/unstructured or in specific topology/structured mode Unstructured mode is robust when nodes join/drop out frequently but makes finding a specific file more difficult Structured mode is organised (using hash tables) and files can be found/searched for easily Peer-to-peer software is run on computer/node Software queries other nodes/computers to find required file Search request has 'time to live' (TTL) after which it ceases to search Search request propagates from queried machines/nodes to others When found, software downloads/copies file from node to node Other nodes/computers can copy downloaded file from each node Sections/fragments of file can be copied from different nodes at once, increasing the overall speed of whole file transfer to a node.	**6**

Question	Answer	Marks
3(b)	**Six** from: Nodes are more susceptible to remote attack/intrusion IP address of users is clearly visible to others so (much) easier for hackers/malicious users to target Knowledge of IP address can be used to steal user data/files/information resulting in fraud/identity theft/blackmail Malicious code can deliberately falsify routing tables of nodes Answers/replies to requests can contain malicious code/malware Downloaded files can contain/be malware as true source is unknown/not verified Authors of transferred files may be/are unknown so transferred software may not be as advertised/contain trojans/malware that send data back to author Sections of downloaded files can be replaced with malware Downloaded Bit Torrent files often stored by default in folder along with other user data exposing the data to others Can inadvertently expose other areas of storage to others leading to unintentional access to data/session can be left open unintentionally Bit Torrent traffic is not encrypted by default/if no VPN is used and UDP and TCP ports are used by Bit Torrent, may be subject to monitoring by ISP so user data may be stored for all to see/read Bit Torrent transfers are monitored/shared by others who may have malicious intent Many Bit Torrent transfers are of copyrighted material which may give rise to legal issues.	**6**

Question	Answer	Marks
4	**Eight** from: *Benefits:* Saves time when designing/designs created in shorter time Easy to edit/change/alter/amend designs without redrawing Fewer errors/lower percentage of errors in drawings Software can automate (most of) the designs tasks Code/design/drawings can be copied and reused multiple times Designs/files can be saved and sent to others Accuracy is improved compared to manual methods of design *Drawbacks:* Designs can be lost because of the sudden breakdown of computers/data corruption Designs/files prone to viruses/malware Designs could be easily “hacked”/stolen Training/learning how to use the software can take a long time High cost of purchase or new systems Time/cost of training the designers to use CAD Need for regular updating of software/operating systems Needs less employment of specialised designers because of use of CAD/CAM systems. *Must be at least 2 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
5	**Eight** from e.g.: *Advantages:* Satellites in geostationary orbit so ground stations for uplink can point directly at them so less power needed Receiving dishes can point directly at satellite resulting in less fluctuation in signal Low/medium orbit satellites provide low latency connections with high speeds Physical connections not required so access can be from anywhere/remote areas in sight of satellite No need for extensive ground-based infrastructure Can be used by aircraft/ships to provide internet connections to passengers Satellite coverage can be optimised for data transfer to provide high speed/bandwidth broadband connections *Disadvantages:* Satellites in geostationary orbit are c. 18 000 km high so signal has to travel c. 36 000 km resulting in delay Delay in signals can result in latency worse than for dial-up connections Long latency can affect secure connections (SSL) which may not succeed TCP protocols may not function when using high latency connections so internet connections may be limited in service provision Interference by weather conditions can reduce signal quality/connection usability Must be line of sight to satellite/physical obstructions block signals Reflections from objects near path of signal can reduce signal quality by phase cancellation effects. *Must be at least 2 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
6	*Max **two** from:* Digital currency is a form of currency that is non-physical/exists only in digital domain/recorded electronically/e-money Allows for (almost) instantaneous transactions Allows easy transactions across borders/regions *Max **seven** from:* *Effectiveness:* Provides fixed/unchangeable record of transactions Transactions can be almost/seemingly anonymous Transaction fees can be much lower than with other forms of currency Reduced fraud from chargebacks as these are not possible Funds are received faster than with other forms of transaction International transactions are easier than with other forms of currency *Lack of effectiveness* Difficult to understand how to use Not widely accepted by retailers/sellers Digital currency 'wallets' can be lost /fail if password lost, leading to failed transactions Transactions cannot be reversed in case of error Value can fluctuate, leading to uncertainty.	**7**

Question	Answer	Marks
7(a)	**Four** from: Computer system capable of running/processing the appropriate applications/multimedia capable Router/modem to connect to the internet Telephone equipment/VoIP system for audio exchange Speakers to output the sounds of the conference delegates Microphones for input of the voices of the delegates/convert analogue sounds to digital signals (Optional) web camera if video is required.	**4**
7(b)	**Six** from: Ability to share presentations across multiple computer systems Ability to enable co-browsing of internet/browsing as a group Ability to enable screen-sharing for group viewing of documents Implementation of instant messaging/equivalent for messaging/chat Implementation of VoIP for voice conversations Cross-platform compatibility for file sharing Ability to go 'private' to allow moderators/participants to have confidential conversations. A support system for participants to get help/assistance.	**6**

Question	Answer	Marks
8	**Five** from: *Similarities:* Last tests before software product is deemed ready for release Both carried out by persons other than the programmer Both have a significant impact on the final quality of the product *Differences:* Alpha testing uses white and black box testing whereas beta testing (usually) involves only black box testing Alpha testing is carried out by employees of the software company whereas beta testing is carried out by third-parties/impartial persons Alpha testing takes place under the control of the developers whereas beta testing takes place under the control of the users Reliability and security of the software are covered by beta testing but not by alpha testing Alpha testing is a phase that leads into beta testing. *Must be at least 1 of each for full marks.*	**5**

Question	Answer	Marks
9	**Six** from e.g.: Timeline/table to show the times/schedule/progress for each task Timeline/table to show subtasks Timescale to represent time intervals for chart in days/weeks/months/hours Current date to show today's date on the chart Milestones shown as checkpoints/task completion dates (Gantt) bar showing task as graphic representing task duration Bars showing planned start/end dates Labels/notes/bars showing contingency/slack time Colours representing e.g. finished/completed tasks Annotations/lines representing critical path.	**6**

Question	Answer	Marks
10	**Six** from e.g.: Use of 'throw' to trap error/exception by testing block of code Use of 'try' to determine program flow when error occurs/handle the error/using nested blocks of code Use of 'catch' to allow execution of code after an error/generate custom error message via e.g. 'message.innerHTML'/catch error in 'err' Use of 'finally' to execute code after catch/try/catch regardless of result from these Use of 'error' object to provide information about the error 'Error' returns name with message about error for use in custom error handling Example of return from 'error' e.g. EvalError/ RangeError/ReferenceError/ SyntaxError /TypeError/URIError.	**6**

Question	Answer	Marks
11	**Four** from: Uses forward mapping of pixels from one image into next Pixels from start image/sad face mapped to new position in final image/smiling face Setting of control points in start image to map exactly to points in final image Pixels in start image mapped to points in final image that are determined by 'weighting'/Gaussian function in software Pixels next to control point move more than those further away/less than control points Pixels further away from control point are less affected by software algorithm so move less.	**4**

Question	Answer	Marks
12	**Six** from: Can be integrated/projected into firefighter masks to provide easily visible information Thermal imaging information can be viewed without the need for hand-held devices Information from sensors shown directly to firefighter/not obscured by smoke Overlays navigational information enhancing safety during firefighting/in smoke filled areas/low visibility Provides real-time information/instant updates of situation direct to firefighter Real-time/live information/tracking information can be sent back to operational headquarters/control staff Provides real-time/live positional information of other firefighters/equipment.	**6**