Cambridge Assessment International Education

Cambridge International AS & A Level

INFORMATION TECHNOLOGY **9626/32**

Paper 3 Advanced Theory **March 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 March 2021 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

This document consists of **10** 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)	**Six** from: The home computer requests/initiates the stream NIC on server determines destination address for file Video file is converted into (IP) packets by NIC on server NIC on server constructs and sends packets from server/use of packet switching IP packets contain details of destination address/destination IP address Packets are sent from network 1 to router A Router A compares packet (IP) destination IP with routing table(s) Router A chooses appropriate/best next router to send packets based on contents of routing table(s) Applies (any) quality of service (QoS) rules to prioritise the packets (of the streamed video) Sends packet(s) to next router(s) Next router(s) carry out same tasks as router A to pass packets through the networks Router E receives packets from the internet routers ….and transfers/passes them to internal/home/user network/to laptop viewing video Dynamic routing tables of routers may be set up/updated to ensure QoS for streaming.	**6**
1(b)	**Two** from: Use router's quality of service/QoS configuration to prioritise the video stream Use (the router's) traffic shaping configuration to prioritise the video stream Set up/configure specific ports for the video service/application to use 'Intelligent' QoS will prioritise in pre-determined order: voice, video, application traffic, print services/file downloads	**2**
1(c)	**Six** from: Extension of HTTP to provide secure communications/Hyper Text Transfer Protocol Secure Encrypts using Transport Layer Security (TLS)/Secure Sockets Layer (SSL) Protects/ensures the integrity of data sent to/from website over internet/through the networks Operates at application layer to encrypt/decrypt using TLS Authenticates website using a (public key) certificate Controls access by restricting access to the site to authorised users Protects the privacy of data sent to/from website over internet/through the networks Protects against man-in-the-middle attacks/eavesdropping on the data Protects against alteration/modification of websites Protects against insertion of malware/malicious code into website code.	**6**

Question	Answer	Marks
2(a)	Virtual reality creates a 3D environment that excludes/does not include the real world Augmented reality overlays digital elements onto a live view of the world/environment.	**2**
2(b)	**Six** from: Firefighters can be trained in a safe environment Training experience is more realistic than other methods/presentations Training uses all/more senses to experience the event/scenario Firefighter can experience a range of/more scenarios for training Firefighter can interact with others doing the same training Firefighters are more likely to retain the information/experience/gain confidence than if it was presented as presentations/notes Firefighters can access the training at any time Training can be carried out wherever they wish Training scenarios can be repeated at any time Resources are saved and are less costly.	**6**

Question	Answer	Marks
3(a)	**Three** from: e.g.: Creating time-based one-time passwords Specifying the details/SSID/password/phrase/encryption type for WiFi network login Automatic login for e.g. web pages for registered users Use for storing payment addresses/cryptographic keys when using digital wallets/digital currencies Used in augmented reality to determine the position of objects Can contain the 'compose email window' complete with desired address when code is scanned Can contain phone numbers that are dialled when code is scanned Can be used to check-in/record location for tracking purposes Contact details/email addresses/SMS details that open apps/set up messages when scanned Calendar data/meetings/business details that can be added to contact lists/address book when scanned Plain text with extra details/used by external app for bespoke/tracking reasons.	**3**

Question	Answer	Marks
3(b)	*Evaluate: Discuss the importance of, weigh up the advantages and disadvantages, judge the effectiveness, weigh up your opinions.* **Six** from: *Advantages:* Can be scanned using any smartphone/device with scanning capability so accessible to users QR codes can encode almost all types of data e.g. numeric/binary so flexible Scanning occurs very fast so products can be checked out quickly at tills QR code has good fault tolerance so even if some part of the code is damaged information can still be decoded Stores large amount of information unlike 1D barcodes so provides more details to users A QR code takes up less space on the packaging than a large amount of written information on the packaging so there is more room on the packet for images/advertisements. *Disadvantages:* Smart phones used to scan QR codes are expensive compared with simpler phones so not all users have access Users are not familiar with its use so may ignore the codes Requires training in order to fully understand the use and idea so users have to gain the skills/take time to learn/costs to train users Aesthetically poor as it contains random patterns of square boxes which might not look pleasing on products so might deter buyers Cannot be updated so need to be reprinted/recreated if details change so packaging becomes outdated Requires an internet connection to allow access to the additional information so information may not be available. Must have at least 1 mark from each for full marks. *1 mark available for a reasoned opinion/conclusion*.	**6**

Question	Answer	Marks
4	**Six** from e.g.: Chat room is an area on the internet/digital forum for communication/no special software needed/can use web browser whereas instant messaging uses an application for communication Chat rooms are used for sharing views on topics whereas instant messaging is used for conversation-type exchanges Chat rooms can be created for specific topics only, whereas instant messaging is used for any topic/not restricted Chat rooms are thread-based/may be over time/not instant whereas instant messaging can occur in real-time Chat rooms can exchange/show images and text whereas instant messaging is used for text-based messages Chat rooms may involve more than two people whereas instant messaging is (usually) between only two people/one-to-one Chat rooms may be moderated whereas instant messaging is not Chat rooms may be by invitation only/exclusive whereas instant messaging is personal/uses lists of contacts Chat rooms use 'user names' whereas instant messaging (usually) uses real names/numbers Chat room (messages) are visible to all whereas instant messages are private/encrypted.	**6**

Question	Answer	Marks
5(a)	**Six** from: Creation of system and software requirements for the application Analysis to create models, schemes, and business rules Design to create the technical designs/design specifications including e.g. language Implementing the code by writing the code/units/integration of units of software Creation of technical/user documentation Testing using a test plan to discover and correct errors Deploying the software by the installation, migration, support, and maintenance of the finished product.	**6**
5(b)	**Six** from: Alpha testing is carried out by employees of the developer whereas beta testing is carried out by clients/end users/not employees Alpha testing uses a lab/test environment whereas beta testing does not require/use this/is in public Alpha testing is carried out at developers' site whereas beta testing is carried out at tester/end user location Alpha testing does not involve reliability testing whereas beta testing does Alpha testing does not involve security testing whereas beta testing does Alpha testing involves both white and black box testing whereas beta testing usually involves only black box testing Critical issues can be fixed/addressed immediately during alpha testing whereas beta testing produces feedback on issues for use at later date/in later versions Alpha testing ensures that the product is fit/ready for moving to beta testing phase.	**6**

Question	Answer	Marks
5(c)(i)	**Two** from: (Teleworking is) a flexible working arrangement in which an employee carries out the duties and responsibilities from an (approved) work site (e.g. home) Working at a place other than the usual place of work for that employee Use of IT/computers/internet/telephones to maintain contact with employers/colleagues/customers/central office while working from home Does not include work done while on official travel or while mobile.	**2**
5(c)(ii)	**Two** from: Productivity/performance may be reduced due to lack of supervision/encouragement/self-motivation Developers may have more flexibility managing their hours, which could increase motivation May be difficult to stop working/disconnect from work resulting in reduced personal time Increased risk of health issues due to longer working hours/working longer with no distractions May become less associated/identified with the software company/employers May incur additional expense on e.g. heating/lighting/electricity/IT equipment May have working difficulty due to distractions/family interruptions May have reduced access to IT support.	**2**

Question	Answer	Marks
6(a)	Create a heads-up display in screen/in line of sight of astronauts Use of a holographic filter/screen to project data from flight instruments/targeting data into forward view of astronaut.	**2**
6(b)	**Two** from: Use of laser light to create images/holograms/highly accurate images of items during production Compare dimensions of items with required dimensions For real-time/instantaneous quality control.	**2**
6(c)	**Two** from: Create 3D images of organs/body/surgical areas Doctor can practise movement/techniques before actual surgery Anatomy training Have patient details displayed in line of sight, providing more sanitary environment than paper/screen.	**2**

Question	Answer	Marks
7	Evaluate: Discuss the importance of, weigh up the advantages and disadvantages, judge the effectiveness, weigh up your opinions. **Eight** from: *Advantages:* Allows more detailed answers to be collected so more data is gathered Allows follow up questions to be asked so that ambiguities/incomplete answers can be clarified Gather detailed data about interviewee's feelings/perceptions/opinions so wider view of responses Achieve a high response rate so more data is gathered Interviewee's own words are recorded so more detail is collected Question wording can be customised to interviewees so that more precise answers can be gathered Precise meaning of questions can be clarified/explained to respondent if e.g. they speak English as a Second Language Interviewees are not influenced by others in the group, so answers are more specific to the individual Interviewer can direct the focus of questioning to collect details Interviewees may be less self-conscious/more confident in a one-to-one situation *Disadvantages:* Can be time-consuming to set up/interview/transcribe so fewer interviews can be done Analysis of questions/feedback can be costly/expensive as it requires e.g. manual data entry Different interviewers may understand/interpret/transcribe interviews in different ways so data may not be reliable Quality of the data depends on the skill of the interviewer so gathered data can vary/be unreliable Sample size is limited due to the availability of interviewers so data may be unrepresentative Respondents may not give honest answers so data may be unreliable Respondents may give answers that the interviewer wants so data may be biased. *Must be at least 2 of each for full marks* *1 mark available for a reasoned opinion/conclusion.*	**8**

Question	Answer	Marks
8	**Eight** from e.g.: *Advantages:* User can use WiFi at low cost/free/with no sign-up fee Allows mobile connections so productivity of (commercial/business) customers is increased Convenient to use when travelling/away from home to keep in contact with others Avoids use of data allowance on mobile phone network/4G connections *Disadvantages:* Connections can be unreliable Some internet services may not be available/may be restricted by airport Advertisements/commercial messages may be inserted into session by airport Airport may require contact details/credit card details/sign up before allowing connection Wireless traffic can be intercepted by others on/nearby WiFi network Can be subject to 'man in middle' attacks to capture personal/financial data Personal/private data can be stolen and used in fraud Malware/malicious code can be placed/injected into web pages/emails Bandwidth may be limited unless extra fees paid. *Must be at least 2 of each for full marks* *1 mark available for a reasoned opinion/conclusion.*	**8**

Question	Answer	Marks
9(a)	**Three** from e.g.: Cost of the human activity/labour/skills needed/used to carry out each task Cost of the materials/resources that need to be purchased for carrying out each task Cost of equipment/tools/software required for each task Contingency costs to cover unexpected activities/risks Cost of any insurance needed to cover project failures.	**3**

Question	Answer	Marks
9(b)	**Six** from: Comparing costs with those of similar house building projects previously completed/analogous estimating/top down estimating Estimating costs using historical/statistical data/data sets from several similar projects and extrapolating to fit current project details/parametric estimating Averaging the costs of several estimates to produce costs for current project/'three-point' estimating Calculating the cost of every activity in detail and using the results to calculate total cost with accuracy/bottom up estimating Using PERT estimates by calculation/formula Most likely cost with project having no difficulties Worst possible cost estimate with project tasks all going wrong Can produce an optimistic cost with all tasks succeeding better than expected PERT 'three-point' estimating used to eliminate bias/uncertainties/risks of other methods Providing an estimate of time taken for each task, allowing costs of personnel and equipment hire to be calculated.	**6**

Question	Answer	Marks
10	**Six** from: GPS receiver 'sees'/receives signals ....from four (4) satellites simultaneously Satellites transmit time (of their atomic clock) to GPS receiver which uses times from satellites to calculate current time/allow for inaccuracies in GPS receiver clock/reset GPS receiver clock Satellite and GPS receivers' times are synchronised GPS receiver uses almanac of satellite positions/updated from satellite signals Satellites transmit (pseudo random) code at set time GPS receiver runs same code at same time and compares with that of satellite GPS receiver uses difference in code timing/lag of code to calculate the time it takes signals to travel from satellite to it GPS receiver analyses the radio signals to determine/calculate distance between it and satellites GPS receiver analyses the radio signals to determine/calculate location of (four) satellites Error correction techniques allow for atmospheric issues/inaccurate satellite data Uses 3D trilateration to calculate position and altitude GPS receivers overlay calculated positions/latitude and longitude on stored maps to show visual representation of position Use of four satellites allows altitude to be calculated and displayed.	**6**