Cambridge Assessment International Education

Cambridge International AS & A Level

INFORMATION TECHNOLOGY **9626/33**

Paper 3 Advanced Theory **October/November 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 October/November 2022 series for most Cambridge IGCSE™, Cambridge International A and AS Level 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: Store html documents (on secondary storage devices) Store text/images/style sheets/scripts associated with HTML pages Process (incoming) network requests from clients/users/web browsers Use HTTP(S) to receive and deliver communications/communicate with clients/web browsers Provide server-side script services/PHP/ASP for dynamic generation of HTML pages.	**2**
1(b)	**Two** from: Manage/allow creation of email accounts Host domains for provision of email accounts Send email/outgoing requests using Simple Mail Transfer Protocol/SMTP Receive email/processes incoming mail using Internet Message Access Protocol/IMAP/ Post Office Protocol/POP3. Stores email (messages)/uses store and forward model.	**2**
1(c)	**Two** from: Accept print jobs from client computers for printers on a network Manage/direct/allocate print job to appropriate/user defined printer Queue print jobs if allocated printer is busy Allow inspection/management of print queues Allow accounting/charging/quota of print jobs Allow enforcement of admin policies for printing Allow authentication/water-marking of print jobs.	**2**

Question	Answer	Marks
2(a)	**Six** from: Four fields of 2 bytes/16 bits each to hold data about addressing and about the payload data Source port number field used to reply if needed/set to zero if not used/not required Destination port field used to specify receiver address/port number Destination port field is mandatory/always required for delivery purposes (Total) length of packet/header plus data field in bytes used in error checking Length is minimum length of 8 bytes/length of header Checksum field containing results of calculation to check for errors Checksum value is optional in IPv4 but mandatory in IPv6;/set to zero if no value calculated.	**6**
2(b)	**Three** from: UDP does not provide acknowledgement of the receipt of a packet so it is deemed unreliable as packets may be lost UDP does provide for ordering of packets so there is no tracking of messages UDP does not provide congestion control so these have to be separately carried out/at application level Recipient must provide mechanisms to address lack of handshake/ordering/duplication of data/messages which increases complexity/overheads.	**3**

Question	Answer	Marks
3(a)	**Three** from: Identifying the business goals and their impact on the business/organisation Assessing the situation/problem that is to be solved by/what is required from the data mining Defining the goals of the data mining process Producing a project plan.	**3**
3(b)	**Four** from: Gathering the data required for the process 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 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**

Question	Answer	Marks
4	**Eight** from: *Positive impacts include:* Currency records/transactions are encrypted for security …so privacy/anonymity is assured Not regulated/subject to financial laws …so is not subject to interest rate charges/fees/surcharges during transactions Not subject to exchange rates when used internationally Cannot be seized/'garnished'/frozen as no ownership records are held Offers complete anonymity as there are no (central) records of ownership/transactions *Negative impacts include:* Transactions are irreversible/cannot be cancelled/be recalled …so if the currency can be sent to the wrong address the value is lost Price/value of currency is not regulated and fluctuates wildly as it is a commodity …so is a high-risk activity Subject to fraudulent claims of high returns for little investment as is a new technology/area of finance Encrypted records of currency hold value but not ownership …so if its stolen/lost there is no proof of ownership so it's lost Private keys for cryptocurrency can be permanently lost from local storage due to malware/data loss /destruction of/damage to physical media …so cryptocurrency cannot be spent/used/trade resulting …so it is effectively removed from markets Currency can become worthless if markets fluctuate/provider goes out of business/stops trading Some countries do not allow cryptocurrency use …so goods/services cannot be purchased from/in these countries with cryptocurrency. *Must be at least two Positives and at least two Negatives for full marks.* *Max 6 marks if all bullets/statements/points.*	**8**

Question	Answer	Marks
5	**Eight** from: *For:* Client/customer satisfaction is the highest priority from the earliest stages to the completion of the app development Changes in client/customer requirements can be accommodated at any stage up to final handover of app Agile development produces working/deliverable software for the client in short timescale/early in the development process Developers and users (must) work together throughout development of app to ensure app meets client/customer requirements Face-to-face conversations are often used as most efficient method of fast communication of information/ideas Agile method is deemed to promote/encourage a constant pace of development (indefinitely) so there is no 'downtime' waiting for others Errors/mistakes are deduced/corrected quickly as there is constant testing of the app as it is being developed Regular/iterative reviews/testing allows quick correction/alteration of developing software to meet changing demands of client/customer/users leading to technical excellence/good designs Developer teams are allowed to 'self-organise' leading to better working practices/designs *Against:* Requirement for face-to-face/daily communication means that developers have to work is same building/location Design specifications/cost estimates/project plans are not (often) accurate as design changes over time Milestones are difficult to set/recognise as development progresses as developers cannot predict with certainty what they plan to do/create in next week/month/can only predict what e.g. features they will address in near future. *Max 6 marks if all bullets/statements/points.*	**8**

Question	Answer	Marks
6	**Eight** from: *Advantages:* Small/directional antennas point directly at each other …so can use same frequencies as neighbouring transmissions without interference/make economical use of radio spectrum Directional antennae provide increased performance with low power requirements Narrow microwave beams do not interfere with other equipment Small antennae/devices can be used so operations can be mobile e.g. TV sporting transmissions/can be set up quickly to cover unfolding events/can be used in portable radio systems Have large bandwidth …so can carry greater amount of data compared to other media/can carry more radio/telephone channels *Disadvantages:* High/tall antennae may be environmentally problematic/difficult to install in some areas Line of sight required …so antenna cannot be 'over horizon'/limited to 50 to 80 km apart …so any obstacle will interfere with transmission …so can be interfered with/intercepted Unable to penetrate obstacles/buildings/hills …so positioning of antennas may be intrusive/unsightly Weather/environmental conditions can adversely affect the transmission 'Rain fade' due to absorption of microwaves by water can degrade the signals High pollen counts/dust/smoke can degrade signals due to scattering of signals by particles Solar events may affect transmissions/signals so interfere with communications Most of signal passes through antennae so transmissions can be intercepted behind official antenna/in space by satellite so security can be compromised. *Must be at least two Advantages and at least two Disadvantages for full marks.* *Max 6 marks if all bullets/statements/points.*	**8**

Question	Answer	Marks
7(a)	**Two** from: No central bank needed to provide payment services/hold money Payments are made peer-to-peer/direct between persons No central regulatory authority to oversee transactions/financial dealings.	**2**

Question	Answer	Marks
7(b)	**Four** from: Bitcoin wallet/software is set up to provide a Bitcoin address to/from which payments are made Bitcoin addresses are complex number/character sequences staring with a 1 or a 3 Bitcoin(s) are purchased from a Bitcoin exchange and loaded into the wallet Use of credit/debit/bank card/bank transfer only to purchase Bitcoins to store in wallet Bitcoins can be transferred directly from one wallet to another by specifying Bitcoin address of seller to send to Use of Bitcoin debit card that can debit wallet directly when used for payments.	**4**

Question	Answer	Marks
8(a)	**Four** from: Unlimited/very large numbers of students can participate Unrestricted/open access via the web/internet Can include multimedia/videoed lectures/talks Can include quizzes/interactive tasks for immediate feedback to students Can include online assessments for progress through the MOOC Can include user forums for group discussions.	**4**
8(b)	**Four** from: Students who are not digitally literate will not be able to (fully) participate and not make use of the course materials User-generated course materials may devalue/undermine the validity of the course Students who cannot self-motivate/cannot set own goals will not be able to (fully) participate Barriers of language/translations may exclude/restrict/disadvantage some participants from (fully) taking part Very large amounts of content are difficult to navigate/set up/learn/work through without guidance. Practical experience/training is limited/resources for practical work are limited Some students may not be able/be prepared to devote the time and effort necessary/required for the course.	**4**

Question	Answer	Marks
9(a)	**Two** from: Number of bits transmitted/carried/processed per second/unit of time Units are kbps/kilobits per second (Accept other SI/metric/decimal prefixes e.g. megabits per second) Units are 1KiB/s in binary/IS standard (this is 1024 bits/s) (Accept other IEC standard prefixes e.g. 1MiB/s) ***Candidates might describe how it is physically measured...accept either...e.g.:*** Start video streaming/play on device/send file of known size Use software to capture video traffic/known file from network (over time period of e.g. several minutes/hour) Select video stream from captured traffic and calculate bits per second.	**2**
9(b)	**Two** from: Bandwidth available on the communication channel Level of noise/signal to noise ratio/SNR on the communication channel Number of signal levels used to represent data.	**2**

Question	Answer	Marks
10	**Six** from: Use of anti-malware software/anti-virus/anti-spyware to scan incoming data/packets/requests to network Use of anti-malware software/anti-virus/anti-spyware to scan existing on/new files added to network Use of anti-malware software/anti-virus/anti-spyware software to examine signature data from previous/known threats and comparing it to organisation's data to identify (known) threats Use of firewall to filter packets and block packets identified as containing malicious code Use of proxy servers to hold/use anti-malware software/anti-virus/anti-spyware on requests/incoming data Analyse user actions/behaviour to establish normal/baseline for detection of abnormal/outlier action/behaviour/check what a user normally does/accesses to be able to compare with abnormal accesses by user/check user access times against expected times of access to data Set up traps for intruders that trigger alerts when intruder accesses certain data/'honey trap' files that are tempting to intruders and then set off alerts for administrators Hunt for threats by examining network traffic/monitor network/user activity to reveal patterns/abnormal activity Analyse network traffic patterns to detect abnormal patterns Gather/analyse user access logs/authentication attempts to discover threats Collect detailed information of malicious events/attacks to provide basis of investigations.	**6**