Mark Scheme (Results)

Summer 2021

Question number	Answer	Additional Guidance	Mark
1 (a)	Award **one** mark per point to a maximum of **two** marks. • attribution / acknowledgement (1) • non-commercial / no selling (1) • no derivatives / no changing (1) • public domain / all rights released (1) • share-alike (1)	Accept other wording that has the same meaning.	2

Question number	Answer	Additional Guidance	Mark
1 (b) i	**The only correct answer is B** *A* is not correct because a site map shows links not flow. *C* is not correct because a wire frame shows page structure not flow. *D* is not correct because a data model shows database structure not flow.		1
1 (b) ii	**The only correct answer is D** *A* is not correct because a flowchart may take up more space than a text description *B* is not correct because both text and flowcharts are easy to email. *C* is not correct because flowcharts will usually have text components and will rely on a language for that.	Note use of the term 'best' in the question.	1

Question number	Answer	Additional Guidance	Mark
1 (c) i	Award **one** mark for one of: • data is a raw/unorganised/unprocessed fact/number/words/statement/etc. (1) • a fact without a context (1) • in itself, data has no meaning (1)		**1**
1(c) ii	Award **one** mark for one of: • information is data that has been processed to make it useful (1) • data that has been given a context (1)		**1**

Question number	Answer	Additional Guidance	Mark
1 (d)i	Award **one** mark for each point up to a maximum of **two** marks: • check/monitor activity (on the system) / scans for malware (1) • check any incoming files (1) • (could) use heuristics/behaviour to detect malware (activity) (1) • quarantine/remove/disable/report malware (allow malware example) (1) • ensures database/list of known malware is kept up-to-date (1)		**2**
1(d)ii	Award **one** mark for each point up to a maximum of **two** marks for a **linked** explanation: • phishing/fraudulent emails/human fallibility/social engineering (1) allowing an attacker to bypass security measures (1) • insider threat/disgruntled employee/accidental damage (1) damaging the data (1) • external attack/hacking (1) stealing/corrupting/encrypting the data / exploiting vulnerability in firewall/OS/software (1) Examples: • A phishing email may allow a hacker to get user credentials (1) and then be allowed to log in to the system (1) • A sacked employee may leave a backdoor into the system (1) allowing them to destroy data afterwards (1) • A hacker may use an exploit to get into the system (1) and encrypt the data for ransom (1)	Answers must be applicable to data. Do **not** accept malware or any subset of malware.	**2**

Question number	Answer	Additional Guidance	Mark
1 (e) (i)	Client-side scripts run on the client's/visitor's computer, server-side scripts run on the server (1)	Accept specific language differences	**1**
1(e) (ii)	Award **one** mark for each point up to a maximum of **two** marks for a linked explanation. • this reduces the load on the server (1) • saving money/resources/bandwidth/processing power on the server (1) • reducing the delay/lag when data is moved / visitors get a faster response to their actions (1) • giving the client/visitor a better/improved service / increasing client/visitor satisfaction (1) Examples: (Using client side scripts): • gives a reduced server load (1) gives a faster service to clients (1) • saves money (1) by reducing how much the server needs to do (1) • reduces lag for the client (1) because less bandwidth is being used (1)		**2**
		Total for Question 1	**13**

Question number	Answer	Additional Guidance	Mark
2 (a)	Award one mark for each point to a maximum of **three** marks for a linked explanation involving these ideas: At least one of: • set of requirements (1) • measurable criteria (1) • agreed (with the customer/client) (1) And at least one of: • comparison of performance against criteria/specification (1) • may involve product/delivery/installation (1) Examples: • There needs to be a set of criteria (1) agreed by the customer (1) that can be measured to see if they have been met (1) • A set of customer (1) requirements (1) that can be compared with delivered product (1)		**3**

Question number	Answer	Additional Guidance	Mark
2 (b) (i)	Award **one** mark for each answer to a maximum of **two** marks. • employee/user (1) • network manager (1) • network administrator (1) • (network) technician (1) • architect (1)		**2**

Question number	Answer	Additional Guidance	Mark

2(b) (ii)	Award up to **two** marks for each of **two** descriptions such as:
	
	• a security process involving **backup** such as:
	   o a secondary/remote backup stage (1) using cloud/external storage / with a recovery process (1)
	• a security process involving **the firewall** such as:
	   o controlling external access (1) setting the permissions/port numbers/other specified property (1)
	• a security process involving **the server** such as:
	   o controlling access (1) setting password parameters/other specified property (1)
	   o system anti-malware (1) centralised control/co-ordination of scans (1)
	• a security process involving **a networked computer/PC** such as:
	   o enforcing time out on inactivity (1) so PCs are not left open (1)
		Allow two of the same type of process.
		Do not allow any devices not shown in the diagram, such as WAP
			4

Question number	Indicative content.	Additional Guidance	Mark
2(c)	Network metrics include speed, bandwidth, throughput, scalability, latency, error rate, packet loss, availability, jitter. **Note:** candidates only need to look at a selection of these. Metrics are a way of assessing network performance. Metrics may be assessed qualitatively or quantitatively. Scalability and availability may be assessed qualitatively but they could also be quantitative. Quantitative: metrics are given numerical values which may be measured by network monitoring and logging tools. The data should be logged over time and then analysed by analytical software. Qualitative: metrics are given descriptive values. The values may be based on measurements, but they could be assessed by e.g. user complaints, customer reviews. Desirable metrics quantities are: • high; speed, bandwidth, throughput, scalability, availability • low; latency, error rate, packet loss, jitter. All of the metrics are suitable for the network in the question. Contexts could be: • LAN speed/performance • server performance • communications equipment/router/switch performance • storage access • backup and/or restore process • Internet access to cloud storage. **Not** general internet performance as this would be an ISP responsibility Network metrics apply to the hardware. They may apply to network operating systems and firmware. They would not normally apply to applications.	Measurement of individual metrics. Candidates are **not** required to know the names of software tools or how they work. Accept any reasonable attempts to explain measurement.	6

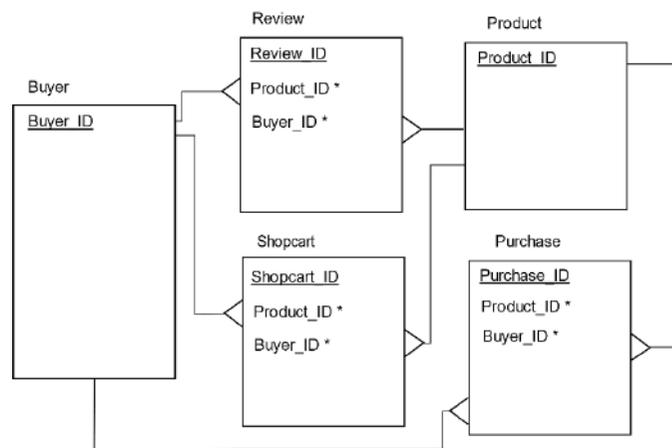| Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1–2	• Demonstrates limited knowledge and understanding, some of which may b • Applies understanding with limited coherence to produce a response that lack
Level 2	3–4	• Demonstrates knowledge and understanding, which is mostly relevant and may inc • Applies understanding to make some coherent connections and a partially de
Level 3	5–6	• Demonstrates accurate and relevant knowledge and understanding thr • Applies understanding coherently to produce a fully developed resp
Total for Question 2		**15**

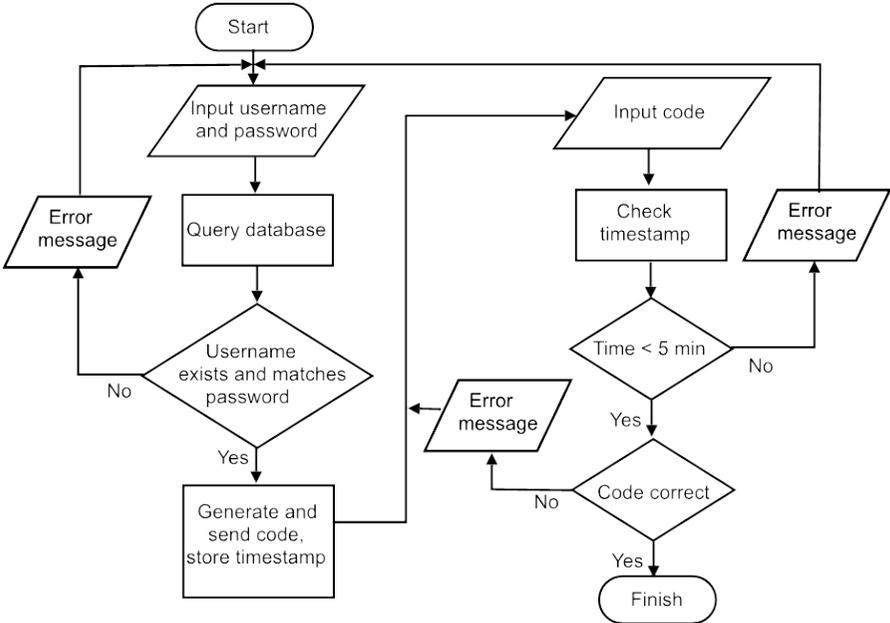| Question number	Answer	Additional Guidance	Mark
3 (a)	Award **one** mark for each point up to a maximum of **two** marks for a linked description of Patch and Upgrade. Patch • minor improvement • addresses a security issue/a comparability issue/a bug/other stated minor improvement Upgrade • major improvement / new version • includes significant alterations/important changes/stated major improvement Examples: • A patch is a minor improvement (1) while an upgrade is a new version (1) • A patch might fix a small code error (1) an upgrade will combine lots of fixes (into a new version) (1)	Accept examples for the improvement etc.	2

Question number	Answer	Additional Guidance	Mark

3 (b)	Answers must be in the context of compatibility problems.
	Award **one** mark for each point up to a maximum of **two** marks for each of **two** linked explanations.
	• file types
	   ◦ old software/new software may have proprietary file type(s) (1)
	   ◦ that is not supported by/cannot be read by/ cannot be written to by the other software (1)
	   ◦ a third party file conversion may be needed (1)
	• features
	   ◦ old software may include features that the new software does not have/cannot replicate (1)
	   ◦ the user may need more than one piece of software to replicate the original (1)
	   ◦ these may have their own issues with working together (1)
	• included content
	   ◦ old software may include content such as fonts/images that are copyrighted (1)
	   ◦ licensing may prevent them being used in other products (1)
	   ◦ it may be difficult/impossible to find/contact the software writer/copyright holder (1)
	   ◦ alternatives may have to be found (1)
	• OS patch/upgrade
	   ◦ changes to the operating system (1)
	   ◦ may change/remove files/resources that the software needs (1)
	   ◦ the software will be unable to work/run until a further patch/workaround is issued (1)
	   ◦ the patch/upgrade may need to be reversed (1)
	• Wrong OS version
	   ◦ patch/upgrade may be for new/different OS version (1)
	   ◦ installed OS may not support the patch/upgrade (1)
	   ◦ may be problems with e.g. drivers/dlls/registry values/file locations/permissions (1)
	• Hardware limitations
	   ◦ patch/upgrade may be too large for storage/memory available (1)
	   ◦ new features may not work on/be incompatible with old hardware (1)
	   ◦ patch/upgrade may require more powerful processor/machine (1)
		For each explanation, look for two second level bullet points from any top level bullet point	4

Question number	Indicative content.	Additional Guidance	Mark

3(c)	Answers should be in the context of using cloud computing to process data.
	
	Advantages:
	• to users
	  ◦ can play a file where the app does not support it
	  ◦ can process data where the device is unable to do so
	  ◦ does not need multiple apps
	• to the app company
	  ◦ get users for their app, increasing ad revenue etc.
	  ◦ has records of what users view, can be monetised
	  ◦ can use the system to expand into other devices/functions
	
	Disadvantages:
	• to users
	  ◦ device must be online when using the app
	  ◦ requires use of data allocation/costs money for data
	  ◦ third party has control of some device/app functions
	  ◦ may be lag in receiving media due to connection speed, bandwidth issues
	  ◦ third party has records of users viewing/playing habits
	• to the app company
	  ◦ needs money/resources for the servers
	  ◦ solution must be easily scalable, may need to be set up in several countries to overcome lag issues
	  ◦ need to advertise the solution to get users
	  ◦ need to deal with legal issues, copyright, legality of what users are viewing in different countries
			6

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1–2	• Demonstrates limited knowledge and understanding, some of which may be inaccurate. • Applies understanding with limited coherence to produce a superficial and unbalanced discussion.
Level 2	3–4	• Demonstrates knowledge and understanding which is mostly relevant but may include some inaccuracies. • Applies understanding to make some coherent connections, leading to a discussion that shows some development, but may be unbalanced.
Level 3	5–6	• Demonstrates accurate and relevant knowledge and understanding throughout. • Applies understanding coherently to produce a balanced and fully developed discussion.
		Total for Question 3 12

Question number	Answer	Additional Guidance	Mark
4(a)	**The only correct answer is D** *A* is not correct because Purchase.Quantity must be entered by the purchaser/ taken from the shopping cart entry. *B* is not correct because Shopcart.Quantity must be taken from the shopping cart entry. *C* is not correct because Purchase.Delivery_stage will need parcel tracking information from a third party/another system.		1
4(b)	Award **one** mark for: • all **five** correct relationships (the lines) (1) • any **three** correct relationship **types** (1) • remaining **two** correct relationship **types** (1) • all **four** correct primary keys (1) • any **two** different correctly identified foreign keys out of Review, Shopcart, and Purchase (1) • **third** correctly identified foreign key (1) 		6

Question number	Answer	Additional Guidance	Mark
4(c)

Award **one** mark for each point to a maximum of **six** marks:

- query database/find stored username and/or password (1)
- compare password **and/or** username (1)
- at least **one** error message in the correct place (1)
- generating a code **and** storing the time (1)
- input code at an **appropriate** point (after code generation) (1)
- check time (1)
- check code (1)
- at least **two** correct loops (1) | Correct symbols are in Appendix 7 of the specification, but allow any consistent use of alternatives. Different wording is acceptable as long as the meaning is clear and consistent | **6** |

Question number	Answer	Additional Guidance	Mark
4 (d)	Award **one** mark for each point up to a maximum of **three** marks. • specifically designed for data manipulation (1) • proven reliability/extensively tested / been around for long time/for 50 years (1) • large body of knowledge/large community of users/lots of examples available (1) • simple to get started/learn the basics (1) • has a powerful instruction set for more advanced users/data manipulation (1) • stated example of instruction set (1) e.g. select – from – where / ordering by / use of wildcard	Only allow **one** example for point 6	3
Total for Question 4			**16**

Question number	Indicative content	Mark

5	Responses should be in relationship to the context; use of information technology could have a positive impact on environmental monitoring and efficient use of resources.
	
	Environmental monitoring
	• Water
	  ◦ quality, acidity (pH), colour, dissolved oxygen, turbidity
	  ◦ volume/flow, reservoir level, aquifer level, rainfall, metering
	  ◦ waste, quality before and after treatment
	  ◦ annual/seasonal cycles
	
	• Temperature
	  ◦ inside and outside temperatures
	  ◦ heat island effects of new resort
	  ◦ energy requirements for heating/cooling
	  ◦ monitoring architectural effects
		12

- Air quality
  - CO2, NOX, particulates, traffic effects, emissions from new resort

- Fishery
  - quality of seawater, temperature, salinity, pollution (e.g. sewage, run off from new paved areas)
  - fish stocks

Efficient use of resources
- Water
  - desalination using solar
  - reservoirs and water capture systems
  - recycling and reuse
  - conservation systems

- Solar
  - photoelectric generation, metering, control systems, storage
  - thermal for e.g. heating water

- Recycling
  - heat, waste, water. Measuring quantities, monitoring systems

Conclusion
Might include:
- positive impact on environmental monitoring
- efficient use of resources
- awareness/use of competing arguments
- comment on the government's claim that smart features will prevent any environmental damage

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1–4	- Demonstrates limited knowledge and understanding, some of which may be inaccurate. - Applies understanding with limited coherence to produce a response that lacks development. - Demonstrates limited awareness of competing arguments. - Conclusion, if present, is generic or unsupported.
Level 2	5–8	- Demonstrates knowledge and understanding, which is mostly relevant and may include some inaccuracies. - Applies understanding to make some coherent connections and a partially developed response. - Demonstrates some awareness of competing arguments, but this may be unbalanced, and partially supports conclusion with evidence.
Level 3	9–12	- Demonstrates accurate and relevant knowledge and understanding throughout. - Applies understanding coherently to produce a fully developed response. - Demonstrates an awareness of competing arguments and supports conclusion with evidence.
		Total for Question 6 12

Question number	Answer	Additional Guidance	Mark

6	Award **one** mark for each item to a maximum of **twelve** marks:
	
	  (a) servers in main bus station
	  (b) hot backup server in secondary bus station
	  (c) fibre connection between server and backup
	  (d) router with WiFi (may be separate) in at least one bus station
	  (e) cable connection from at least one server to router to internet
	  (f) ticket outlet(s) has NFC device and router/modem with internet connection
	  (g) ticket card indicated at ticket outlet(s) and/or bus(es), connecting to NFC device
	  (h) bus stop(s) and bus(es) have WiFi connection (via router)
	  (i) bus stop(s) have display screen(s) connected to router/network
	  (j) bus(es) have NFC card reading device
	  (k) bus(es) have a control box/processor
	  (l) bus(es) have speakers connected to the control box
	  (m) diagram shows a wireless mesh network
	  (n) diagram shows GPS source connected to bus(es)
	  (o) diagram shows GPS receiver/system in bus(es)
		Single line = cable double = fibre dotted = wireless
		
		Where specific symbols are used for a device that occurs more than once, only one copy need be labelled.
		
		Where multiple buses and/or bus stops are shown the components only need to be shown once.
		
		Devices should be marked from their labels.
			12