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 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)	**Two** from: Uses networked storage devices/network of servers It is accessed from the internet Access to storage device is available from any (remote) device Storage devices/data may be managed by third parties/maintained, operated and managed by a cloud storage provider.	**2**
1(b)	**Six** from: Data is not under the direct control of the company/others are looking after the company data Data security/safety is by third party company personnel who may not be trustworthy/as meticulous as company personnel as it's not their data Data is more susceptible to cyber-attack as it is only accessible over internet Data can be susceptible to cyber-attack as there are multiple copies of the data Cloud storage servers can be susceptible to e.g. DOS attacks/suffer outages so company data may be inaccessible Data on cloud storage is more accessible to government intrusions/check Loss of data from cloud storage may result in legal issues for the company when it was not responsible for the actual loss Data is more difficult to permanently delete as there are multiple copies Cloud storage is not standardised across all supplier companies so company may be restricted in choice of supplier/unable to change supplier If the company's internet connection failed, employees would not have access to the data and would be unable to work.	**6**

Question	Answer	Marks
2	**Eight** from: Max 7 from: Satellite remains in orbit (over equator)/follows rotation over Earth so appears stationary over desired target area Multiple satellites (could be) arranged in constellation each providing coverage of small area of surface Multiple satellites arranged in constellation in low/non-geostationary orbits can cover areas farthest from equator/target specific areas of Earth Satellite uses spot beams to target specific areas/users on Earth surface Spot beams provide high(er) bandwidth connection to many users by re-use/multiple use of link frequencies Ground stations/Gateway Earth Stations maintain permanent (microwave) links with satellites Both uplink and downlink connections are maintained from a ground station via antenna/dishes User has (smaller) dish with transceiver via LNB pointed at (chosen) satellite User's dish needs line of sight contact with satellite/in Northern hemisphere dish points in southerly direction/in Southern hemisphere dish points in northerly direction. To gain full marks there must be at least 1 mark from: Ground/gateway stations have (broadband) connection to internet/relay user internet data to from satellite Ground/gateway stations convert data carried by satellite signals to/from IP packets Satellite serves to receive, amplify and re-transmit signal (without processing of data) User has satellite modem/router to receive/transmit/modulate/demodulate data to/from/between local IP packets and satellite link signals.	8

Question	Answer	Marks
3	**Eight** from: *Advantages:* Data (of project) is stored on the server/centrally so is accessible by all team members Data (of project) updates can be seen immediately by all team members Collaboration between managers/team members/clients/stakeholders around the world/in remote areas/not in the office is possible Integrated mail servers instantly notify managers/members/clients/stakeholders about important events/milestones/changes to the project (Most) web-based Project Management tools are compatible with each other so the company can move to another service offering similar services Access control lists can be used to control who is allowed to see/use parts of the system/data (Most) web-based Project Management tools are user-friendly with no steep learning curve/little training needed Backup of data is carried out by host company so individuals are not responsible for their own backups *Disadvantages:* Basic Project Management functionality may be missing e.g. Gantt charts/resource levelling Web-based Project Management tools are not available without internet access/Internet access is required Security/privacy issues may arise as data may not be stored within company/data is stored on a third party server Web-based Project Management tools are (often) not compatible with offline/local PM tools Using internet can allow team members to be distracted from project tasks Some web-based Project Management tools have a monthly fee so involve an ongoing cost for the company. *Must be at least 2 of each for full marks.* *1 mark is available for a reasoned conclusion.*	8

Question	Answer	Marks
4(a)	**Four** from: Timeline for displaying/showing the duration in hours, days, weeks, months and quarters Milestone to show a due date/finish of a phase of a project Bars to show full duration of tasks Arrows to show dependencies of tasks Critical path shown by arrows Dateline showing the current date/time.	4
4(b)	**One** from: E.g. Use of a percentage bar within the task bar Use of a red line on the chart Different colours of bars can be used.	1

Question	Answer	Marks
5	*Evaluate: Discuss the importance of, weigh up the advantages and disadvantages, judge the effectiveness, weigh up your opinions.* **Eight** from: *Advantages:* Less expensive than other methods of gathering information due to reduced costs of employing e.g. interviewers/observers/reader of documents Can be targeted at specific groups of people/only at library users Results can be gathered more quickly than reading documents/interviews Size of sample can be controlled/scaled up with ease compared to interviews Analysis of results can be automatic with online questionnaires Respondents can remain anonymous No time constraint on respondent/respondent can fill in questionnaire in own time Unlike manual questionnaires, online questionnaire can have customised questions depending on previous answers/branching routes through questions *Disadvantages:* Respondents may not provide honest answers/may have a hidden agenda <u>as they are anonymous</u> Respondents may not answer all questions so the data may be incomplete Respondents may not understand questions/may interpret them differently/It is not known if respondents understand No emotion/feelings are conveyed Free response questions can be difficult to analyse Precise customisation is difficult compared to interviews Questionnaire may be difficult to access by disabled persons Questionnaires can be boring to answer so may not get valid data. *Must be at least 2 of each for full marks.* *Must be a proper evaluation to obtain full marks.* *Max 6 marks if bullets/list of points.*	8

Question	Answer	Marks
6(a)	**Two** from e.g.: Low latency/near-instant connectivity between devices such as self-driving cars/machine assembly robots/machine-to-machine connections Densely built-up areas to have better coverage/very high bandwidth connections Use of remote sensors without latency/delay from cloud-based systems May gradually replace land-line connections for internet connections Allow use of UHD/ultra-high definition video on-demand.	2

Question	Answer	Marks
6(b)	**Two** from: Reduced coverage so more cell towers Shortage of/crowded radio frequencies Can interfere with existing use of radio spectrum New devices required to access 5G/not all devices support 5G New technology/technician training required to implement 5G Potential for cyber-attacks Lower latency means almost any device can be controlled remotely High infrastructure costs e.g. for new masts.	**2**

Question	Answer	Marks
7	**Eight** from: Phased implementation of the new system module/part by part The implementation/changeover will be done in stages so time is available for adjustments Users have more time to adapt to/learn the new system so the changeover will run more smoothly Technical staff can concentrate on part of the system/some users so changeover will run more smoothly Problems that arise at the start/first stages are less critical than with other methods so the changeover will have fewer problems Training sessions are/can be confusing for users being asked to work with the new and the old system so users are less productive Several changes in documentation are often required so more time/effort/ resources are used The duration of the changeover can be much longer so there is more disruption to the business/users over a longer period System delivery milestone/endpoint is unclear compared to direct changeover so users are uncertain as to how long the disruption will go on/users will be disrupted for an indeterminate time period. Correctness/completeness/integrity of the data has to be checked several times when a new module is introduced, resulting in a longer time for the changeover with added costs A 'fall back' to the old system becomes more difficult with each new stage so if anything goes wrong/fails later data can be lost The implementation may appear unclear/confusing to the employees and other users, resulting in a lack of motivation/care in the work with more errors Complexity of the implementation makes it more difficult to understand/monitor so more technical support/higher costs/much longer time taken Prone to make mistakes/errors/several adjustments may be needed Fall back to old system becomes impossible in later phases so the changeover has to proceed to completion regardless of the consequences. *Max 6 marks if bullets/list of points.*	**8**

Question	Answer	Marks
8	**Six** from: Users post discrete/diary style text entries for others to read Posts are in (reverse) chronological order/most recent post first to record comments/topics for others to see People react to the posted entries by adding comments Can be work of selected group of authors recording activities/entries Usually restricted to single topic/focussed on one topic Interactive/others/visitors can leave comments on topics/posts Can be open for everybody to read and add comments Others with similar interests to the blogger can participate/join/add comments Allows authors to build social networking/relationship with others online Can lead to proliferation of threads on other topics The blogosphere can allow leaps/jumps between blogs Can include/lead to links to sponsor sites/other bloggers.	6

Question	Answer	Marks
9(a)	**Six** from: Determine user/system requirements/aims of project Create early prototype(s) that are (partly) functional very quickly Gather user feedback on early prototypes Use feedback to inform prototyping to create high quality prototype Repeat steps/iterate prototyping and user feedback stages until product/software is finished Test prototypes/software throughout development Create user/technical documentation as required Present/produce final product for rollout to users.	6
9(b)	**Four** from: Project is divided into smaller sub-tasks that teams of developers can work on concurrently Sub-tasks can make use of specialised teams/skilled specialists Prototypes are created quickly so user/client can see progress/working sections Development time is not wasted if the project/prototype does not work as expected Waterfall method needs to start again if project fails RAD can adapt to changes in user requirement RAD can work well when developers telework Changes/amends/corrections can be made before the final product is created Client/end user is not surprised/disappointed by unexpected end product.	4

Question	Answer	Marks
10	**Six** from: Error event is triggered whenever an exception occurs in JavaScript code The onerror() function only captures the error The onerror() function stores the details of/data of error <u>for later examination</u> Function passes error event details to alert box for display to user Variables are used to pass parameters of the error to the program for further processing Msg is the message that the browser displays (to Jasmine) URL is the file name/path of code in which the error has occurred (so Jasmine knows which file to look in) Line is the line which contains the error (so Jasmine knows where to look in code).	6

Question	Answer	Marks
11	**Six** from: *Similarities:* Both allow multiple devices to connect to a network Both devices can form a LAN Both send the received signal/IP packets onto other devices Both can transfer data to all devices on a network *Differences:* Hubs broadcast all received data to all devices on a network whereas switches filter/examine data packets to determine where to send them Switches store information about MAC addresses of devices whereas hubs do not Switches make more efficient use of network resources/bandwidth than hubs as they do not send all data to all devices Use of hubs can reduce network performance as they use all available bandwidth Use of switch instead of hub can reduce latency and enhance e.g. gaming experience for user. *Must be at least 1 of each for full marks.*	6

Question	Answer	Marks
12	**Eight** from: Use/create/enforce access control policy to dictate use of passwords/type of passwords/change of passwords by staff/employees Use access control to restrict access to the data Ensure that all software is kept up to date to minimise security risks/vulnerabilities Use standardised software/all computers use same software across departments to minimise vulnerabilities from unexpected/unapproved software Ensure that users cannot install unauthorised/non-standard software Ensure that networks are protected by firewalls to control/inward/outward data flow Segment networks to restrict access to sensitive data Use VPNs for remote access to data by authorised users Ensure that all employees/staff are properly trained in network/data security Ensure that all employees/staff are properly trained in identifying threats Ensure that all employees/staff are properly trained in how to respond to security issues/data breaches Use antivirus software to scan company data and any external storage systems e.g. USB memory sticks.	8

Question	Answer	Marks
13	**Five** from: GPS receiver 'sees'/receives signals from (at least) three (3) satellites (simultaneously)/must have line of sight to (at least) three (3) satellites Satellite transmit (their atomic clock) time to GPS receiver GPS receiver uses times from (3 or 4) satellites to calculate current time/allow for inaccuracies in GPS receiver clock/reset GPS reset GPS receiver clock Satellite and GPS receivers time are synchronised GPS receiver uses almanac/database/list of satellite positions/updated from satellite signals Satellites transmit (pseudo random) code at set time GPS receiver runs same code and compares code with that from 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/calculates distance between it and satellites GPS receiver analyses the radio signals to determine/calculates location of (three) satellites Error correction techniques allow for atmospheric issues/inaccurate satellite data Uses (2D or 3D) trilateration to calculate position GPS receivers overlay calculated positions/latitude and longitude on stored maps GPS receiver shows visual representation of position of/displays car amongst images of terrain on screen.	5