Cambridge Assessment International Education

Cambridge International AS & A Level

INFORMATION TECHNOLOGY **9626/32**

Paper 3 Advanced Theory **May/June 2020**

MARK SCHEME

Maximum Mark: 60

Published

Students did not sit exam papers in the June 2020 series due to the Covid-19 global pandemic.

This mark scheme is published to support teachers and students and should be read together with the question paper. It shows the requirements of the exam. The answer column of the mark scheme shows the proposed basis on which Examiners would award marks for this exam. Where appropriate, this column also provides the most likely acceptable alternative responses expected from students. Examiners usually review the mark scheme after they have seen student responses and update the mark scheme if appropriate. In the June series, Examiners were unable to consider the acceptability of alternative responses, as there were no student responses to consider.

Mark schemes should usually be read together with the Principal Examiner Report for Teachers. However, because students did not sit exam papers, there is no Principal Examiner Report for Teachers for the June 2020 series.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the June 2020 series for most Cambridge IGCSE™ and Cambridge International A & AS Level components, and some Cambridge O Level components.

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	*Eight from:* Maximum number of clients (usually) (voluntarily) restricted (to e.g. 100–200). Number or transmitters/radios/e.g. 4 radios in access point restricts number of clients. Range can be restricted by obstacles/materials that obstacles are made of. Range can be restricted by the height of placement of access point. Range can be restricted by the positioning/direction of antenna(s). Range can be restricted by the presence of other electronic devices in vicinity. Limited number of frequencies are available for data transmission. The number of frequencies available varies in different jurisdictions to avoid interference. Large numbers of access points on the same/overlapping frequencies can interfere with each other. Data transmission speed/bandwidth is usually lower/less than wired connection over long distance. Bandwidth of wired can still be high/1000 Mbits/s at 100 m but wireless usually cannot achieve this. Wireless access points have increased security considerations c.f. wired connections so must use password/security keys to connect/join to the access point. Enforced use of passwords can slow down work/frustrate staff when connecting is slow/key is forgotten. Wireless transmissions can be more easily intercepted so data must/should be encrypted. If network key is stolen/publicised, then the key must be changed so every device must reconnect with new key. Additional login details required for guests/temporary workers add to processing requirements in WAP. Security measures add an overhead/slow down processing/data transfer speed. Use of access points may require additional physical/shielding/use of Faraday cages in structure of building to prevent interception of transmissions which increases costs/add structural design complexity/restricts use of mobile connections by users inside the cage.	**8**

Question	Answer	Marks
2(a)	*Four from:* Use of laser lights (from different directions) to form interference patterns. Use of object beam and reference (laser) beams/coherent light with one wavelength. Object beam is passed through scene onto recording medium/high definition plate/polymer plate. Reference beam hits only recording medium. Object and reference beams create interference pattern and create image on a (photographic) plate/recording medium placed where the beams hit. Medium and beams must not move/must be stationary/thermally stable. Reference beam is used to recreate hologram from pattern on plate by diffraction. Holographic images may be copied by embossing/photographic techniques. Holographic images may be viewed in ordinary/white light.	**4**
2(b)	*One from:* Holographic images are difficult to forge. Information may be (secretly) stored in a holographic image for security/identifying the source of the image/additional data about the notes.	**1**
2(c)	*Max two marks per application/use:* For storing large/vast amounts/several terabytes of data on small/12cm optical disks ....green lasers used to read data and red lasers as reference beams. Used in video/movie/video game industry to create artif*i*cial worlds/scenarios. To create 3D images into the video/movie world/scenario. Artists can use holographic images to enhance their work. Used to insert 3D images into 2D paintings. Medicine can use holographic imagery to create 3D images. Used in diagnosis/surgery to assist doctors. Shipping companies can create 3D images of package/shipments. Can assist in load distribution/packing items into containers. Used on credit cards/passports for security. Holographic logos/images used to identify brand/company. Holographic logos/images are very difficult to copy/replicate/remove.	**4**

Question	Answer	Marks
3(a)	*Four from:* Storing data/files on remote servers/over the internet. Servers provided/maintained by third-party companies/different companies. Access is (often) via use of web browser. Can involve use of VPN for secure connection. Devices and data/file servers are location independent/can be accessed from any location with internet access. Resources are shared between client company and provider (seamlessly). Is/can be dynamically changed by provider as and when required without client intervention. Various service models exist e.g. providing the infrastructure/providing the software only/ providing the 'computing platform'/development environment.	**4**

Question	Answer	Marks
3(b)	*Eight from:* Reduction in capital/maintenance costs for companies (as no need for own servers/IT staff). Companies can have as much data storage capacity as required at any one time (without investment in new/additional servers that may not always be needed). Allows access to (more) highly skilled IT technicians who are employed by the providers. IT system performance is monitored by provider (to ensure optimum performance at all times). Productivity is increased (as multiple users can work on same data/files simultaneously). Requirement for investment in high bandwidth/reliable internet connections. Scalability of systems can be dynamic (so that company needs are met quickly). Resources/data storage can be expanded and contracted as required without adding/removing own storage systems/by buying/hiring more cloud service/storage space. Extra/unexpected costs may be incurred when data storage/resources exceed contracted amounts leading to financial problems. Companies do not have complete/full control of their data. Data may not be stored in the same jurisdiction as where the company is based (so regulations may be difficult to comply with). Costs of service provision may be out of the control of the company/may increase unexpectedly.	**8**

Question	Answer	Marks
4	*Eight from:* Use of critical path analysis/method to show tasks that require resources. Use of critical path analysis/method identify the time required for each task. Use of critical path analysis/method to identify priority of tasks. Use of resource levelling / resolving resource conflicts to allocate resources/ stages/phases/deliverable task identification. Use of resource levelling/ resolving resource conflicts to allocate identify demand for resources. Create Project Resource Allocation Matrix/PRAM to show the allocation resources against tasks. Use of Gantt charts to identify resource requirements. Use of collaborative calendars to deploy staff. Strength, Weakness, Opportunities, Threats/SWOT analysis to identify where to deploy resources.	**8**

Question	Answer	Marks
5(a)	*Two from:* Design and construction of robots. Operation of robots. (Use of) computer systems or control/sensory feedback/information processing in/by robots.	**2**
5(b)	*Eight from:* *Advantages:* Artificial Intelligence (AI) in robotics enables closer interaction between robotic and human. Robotics used in homes for domestic duties/cleaning reduce human work. Use of AI-robots in medicine to perform surgery so saving doctors' salary/provide more surgeons. Use of AI-robots in medicine to perform surgery can speed up surgery/allow a greater number of surgery operations. Use of AI-robots in caring for sick/elderly humans reduces the need for carers/cost of carers. *Disadvantages:* Artificial Intelligence (AI) in robotics enables intrusion into/sharing of workspace of humans. Robotics used in homes for domestic duties/cleaning enquire power source/recharging at intervals leading to increased costs. Robots used in homes for domestic duties/cleaning may not be so thorough/discerning/adaptable as humans. Robots have displaced humans from jobs. Robots resembling humans in appearance and actions present more challenging interaction/threats. AI-robots consume more resources/power than simple robots. Social interaction between AI-robot and human requires safety procedures to be in evidence/present to safeguard both AI-robots and humans. Socially correct interaction needs to be in evidence/present to safeguard humans. AI needs to provide communication skills that humans can interact with. Humans may perceive robots as living entities rather than machines which may cause confusion/embarrassment/danger to humans. Some tasks are more acceptable/unacceptable if AI-robot is humanoid in shape. Development of rules/etiquette for AI-driven robots that is comfortable/acceptable to humans. Collaboration between humans and robots is possible with AI. Can provide shared control of devices/functions. Requires AI and systems for understanding social cues from humans. Social cues may be misinterpreted/misunderstood leading to distress on the part of the human. *Must have at least 1 from each to gain full marks.*	**8**

Question	Answer	Marks
6	*Eight from:* Satellite is in geostationary orbit so appears to be at fixed point above surface of Earth. Must be at certain/correct height/c.37 000 km above equator. Satellite has transmitting dish pointed at Earth. Satellite has transponder(s) which receive(s) and transmit(s) signals (to/from Earth). Receive and transmit signals use different frequencies. Transmit (to Earth) signals are in set range/4–8 and 12–18 GHz range. Horizontal and vertical signal polarisation is used to increase capacity. Digital TV signal is encoded as standard/MPEG-2 TV signal with sound/audio (uplinked from Earth station). TV signal may be encrypted to prevent viewing without paying for service. High definition/ MPEG-4 TV signals with multi-channel sound requires more bandwidth. Receiving dish on Earth is pointed at the satellite in line of sight. Dish has Low Noise Block/LNB at antenna to amplify signal allows use of cheaper cable to receiver. Receiver/TV/set-top box decodes signal into pictures and sounds for display on TV. May include system for decrypting ‘scrambled’ pay TV signal.	**8**

Question	Answer	Marks
7	*Eight from:* *Advantages:* Tissue engineering uses biological materials/cell methods to replace/improve/alter biological structures/tissues with a greater success rate in patients. Tissue engineering uses biochemical techniques to replace/improve/alter biological structures/tissues with a greater success rate in patients. Development/use of substitute materials for tissues has reduced costs. Reduces the need for biological donors e.g. use of artificial blood/skin. Reduces the recovery times for patients. Reduces the risk of tissue rejection. Can produce customised tissues/organs/cells for individual patients. Development/use of artificial organs has increased survival/recovery rates e.g. use of artificial liver/pancreas/cartilage/bone marrow. Religious objections to using donated organs/tissue can be overcome using artificial tissues. Production of artificial meat products reduces environmental impact of animal farming. *Disadvantages:* Can be very costly to carry out if sufficient base/original material is limited so new material must be developed. May not be sufficient base/original material available for development. Possible inclusion of hidden diseases/conditions in base tissue. Latent diseases are difficult to find with current technology. Ethical issues are difficult to resolve. Can increase the treatment time as tissue can take longer to grow/synthesise. ***Must have at least 1 from each to gain full marks.***	**8**

Question	Answer	Marks
8	*Eight from:* Interviews are conducted in person or over the telephone. Can be formal/structured or informal. Requires the production of a script which can take time/resources to create/test. Language difficulties can be resolved. Can encourage/allow/enable open-ended responses. Further questions may be asked based on response to previous question. Questions can be explained/further clarification can be added. Can resolve ambiguities in responses. Can achieve a high response rate. Are (mostly) qualitative in outcome. Responders may give the answers that they think the interviewer wants to have so data is invalid/unreliable. Can be (very) time consuming for interviewer and interviewee(s) resulting in increased costs. Questions may be interpreted by interviewer/interviewee in different ways resulting in unreliable/invalid data. Open-ended responses may be transcribed differently by different analysts.	**8**

Question	Answer	Marks
9(a)	*Three from:* Microphone(s) to capture sounds of voices of developers. Video camera/scanner to capture documentation/diagrams. Speakers to output sounds of voices of developers. (Large) monitor/dual monitor to output video/images of developers/documents. Telephone system with conference call facilities. Specialised collaboration devices/meeting wall with integrated camera/monitor/audio/document sharing devices/systems. Router/NIC to connect to network/internet.	**3**
9(b)	*Eight from:* Application/browser must support HTML/JavaScript/animation/instant messaging/streaming video and audio. Users log into the system/conference. A leader/manager controls the sessions and which documents are viewed. Audio mute/unmute controls participants interaction and volume levels …use of text chat to discuss documents. Recording of comments from participants for later review. Can include whiteboard facilities to share documents/diagrams. Use of screen-sharing to share document views/control of documents. Can use slideshow presentations with remote mouse control/markup tools. Use of surveys/polls to gather views of participants on documents. Use of screen annotation tools to markup documents.	**8**

Question	Answer	Marks
10	Eight from: Line 9 <script> declares the code to be JavaScript. Line 10 declares a function called tscorelookup() Line 11 declares variable report. Line 12 declares variable result. Line 12 collects value/18 of 'myTScore' from user input into HTML code at line 5 and stores it in variable 'result'. Line 14 'switch' function is used to compare the value in 'result' against pre-set 'case' values. Line 15 checks value of 'result' to see if condition <0 is TRUE. Line 18 checks value of 'result' to see if condition >100 is TRUE. Line 21 checks value of 'result' to see if condition >=40 is TRUE. Line 24 checks value of 'result' to see if condition >=20 is TRUE …none of these are TRUE/all are untrue/all of these are FALSE …control moves to next case. Line 27 checks value of 'result to see if condition <20 is TRUE …this is TRUE so control passes to Line 28 and FAIL comment is stored in variable 'report'. Line 33 function displays contents of variable 'report' on webpage/displays "Your result is a Fail"; 'break' is included to exit/jump out of any case 'default' is included in case no preceding case/condition is TRUE Including 'default' is good coding practice even if (probably) not required.	**8**