INFORMATION TECHNOLOGY	**9626/32**
Paper 3 Advanced Theory	**May/June 2024**
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 May/June 2024 series for most Cambridge IGCSE, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

[Turn over

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 descriptions 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.

Mark scheme abbreviations

/   separates alternative words / phrases within a marking point

//   separates alternative answers within a marking point

underline   actual word given must be used by candidate (grammatical variants accepted)

max   indicates the maximum number of marks that can be awarded

( )   the word / phrase in brackets is not required, but sets the context

Question	Answer	Marks
1	**Six** from: • Is wireless/no cables used • Uses radio/electromagnetic waves (to carry data) (uses/in) 2.4/5 gigahertz (2.4 G Hz)/5 G Hz) bands) • Frequencies divided into channels for send/receive (1st) channel can be changed automatically to avoid interference/congestion (1) • Uses network key/passphrase/password • For access control/(ID and) authentication of devices (at establishment of connection) exchange of credentials to set up connection • Encryption of data may be used • Data is wrapped/encapsulated in frames/datagrams (1st) • comparable to (but not same as)/just like/similar to Ethernet frames (1) • Frames carry the source/destination MAC addresses (in the same way as do Ethernet frames)(1st) • Carries a data payload (in frame) • Devices send out <u>beacon</u> frames/packets (1st) to announce/inform other devices of presence/SSID (1) • Management frames are used when devices join and leave the Wi-Fi network • Control frames are used to set up/control/change the channels/acknowledge when data has been received.	6

Question	Answer	Marks
2	**Six** from: • (Syntax is) `hsl(…)` used in HTML/CSS (for specifying a colour) • HSL is the hue, saturation and lightness of a colour – ALL 3 for 1 mark • Uses codes/HEX/example of hex value for colours • (Creates) gradients of colours (part of) RGB (model) (1st) • Red, green, blue – ALL 3 for 1 mark • Hue is a <u>value/degree</u> (on the standard colour wheel) (1st) ranging from 0 to 360 (1) • 0 for red/120 for green/240 for blue (1) • Hue is 'brightness'/how much white is added to a colour • Saturation is the intensity of the colour/from no colour/grey to full colour • Saturation is a percentage/% of the colour sign must included with the parameter (1) • Lightness ranges from black (through) to white • Lightness is a percentage/% of the colour/(1st) sign must included with the parameter (1).	6

Question	Answer	Marks
3	**Six** from : • 2D is drawn in 2 dimensional space whereas whereas 3D is in 3 dimensional space Must be both USE LNK • 2D objects are measured in 2 axes/height and width/H × W/X and Y axes • 3D are measured in 3 axes/height, width and depth/H × W × D/X,Y and Z axes • 2D is based on (concept of) frames//3D is based on (concept of) movement (of objects) • 2D objects appear flat • 3D objects can have (appearance of) volume/depth • 2D objects cannot appear to rotate through 360 degrees//3D objects can have (appearance of) rotating through 360 degrees • 2D objects are only viewed from one/front angle//3D objects can (appear to) be viewed from different camera angles • 2D objects are only lit from one/front angle//3D objects can (appear to) be lit from different directions • 2D objects lack texture/solidity//3D objects can (appear to) have texture/solidity • 2D objects cannot/are not realistic in live scenes//3D objects can (appear to) be placed into live scenes/elements with more realistic appearance **Max 1 from:** • valid example of 2D animation e.g.: is used in social media sites/demonstrations/animated presentations • valid example of 3D animation e.g.: is used in movies/cartoons/video games.	6

Question	Answer	Marks
4(a)	**Six** from: *Developers/testers…* • create/write/use a test plan • create/write/use test data • test each/every line of code • test each/every branch in the code • test each/every condition in the code4 • test the calculations/arithmetic • test the logic of the code • test inputs/outputs • can use (automated) testing tools to check code • if test fails/changes are made/errors are noted/errors are found/errors are corrected • repeat the testing • (must) have good knowledge/understanding of JavaScript theory/coding • (must) understand/learn/determine how the code/script works.	6

Question	Answer	Marks
4(b)	**One** from: • Code is used to collect user data/input for use in (subsequent) code/require an answer to a question • Use of confirm()/prompt() popup windows/box to enable user interaction • Code can be inserted into/placed within the HTML of the web page • Code can be stored in external scripts that are stored/executed when called/invoked by HTML code.	**1**
4(c)	**Five** from: **Max three for naming valid events without descriptions:** • Use of onload to execute the JavaScript immediately/as soon as the web page is (fully) loaded into a browser • Use of onchange to execute code when a user changes a value/state of radio button/checkbox • Use of onclick to execute code when a user clicks a button/HTML element • Use of onmouseover • to execute code when a user moves the mouse pointer onto/over an element e.g. an image • Use of onmouseout to execute code when a user moves the mouse pointer off/away from an element e.g. an image • Use of onkeydown to execute code when a user presses a key.	**5**

Question	Answer	Marks
5(a)	**Two** from: • (Graphically/a diagram) to show/describe (how) the data flows(1st) • from input through processes to storage/through (or in) a system (1) • gives designers a visual representation • makes it easier to understand/follow • enables/allows documentation can be created • enables/allows the physical components/elements/software to be created (to make the system work).	**2**
5(b)	**Two** from: • Level 0 shows (only) an overview of the system/no any details of process/level 1 shows more details of processes • Level 0 DFD has only 1 process // level 1 has more than 1 process • Level 0 does not have any data storage // level 1 shows data storage • Level 0 are simple to draw/no technical knowledge required to draw/understand.	**2**

Question	Answer	Marks
6(a)	**Four** from: • Records all transactions/payments before/during a project • Shows/includes direct costs (e.g. cost of materials/IT services/team members time) • Shows/includes indirect costs (e.g. rent/heat/maintenance of IT equipment) • Import data from financial packages/spreadsheets • Automatically calculates/displays a payment/cost/expense/expenditure • Used by managers to calculate/estimate/monitor track expenditure/budget for task/project • Can export data for use in presentations/graphs/analysis (during meetings/discussions) • Links the costs/transactions/payments of the project (1st) to be readily/easily accessible/available to financial personnel/accountants/decision makers (1).	4
6(b)	**Four** from: • Links/organises the data/information/whole of the project (1st)… so its readily/easily accessible/available to decision makers (1) • Displays data/information in various formats (1st)…so that they can be readily/easily understood by project managers/members/stakeholders/clients (1) • Exports data/information to other documents (if required) (1st) or use in reports/presentations/analysis (during meetings/discussions) (1).	4

Question	Answer	Marks
7	**Six** from e.g.: • Different methods allow/enable different levels of learner control in the speed and route through courses/learning • CBT allows leaners almost complete control over time allocation/speed/route • Learners can use networked courses to work at their own speed and to follow their own route/topics through the course • MOOCs allow some control over time and choice of routes through the course • …may allow learners to miss out/skip through content so progress/learning is less effective/impaired • Video-conferencing allows little learner control over speed of activity as it is determined by the teacher/lecturer • Technology allows learners to take control over when/how much/what learning they do because it is not directed by teacher/lecturer as in face-to-face teaching • Technology allows learning resources/facilities to be available 24/7/as and when the learner requires so learner can control their own access • Technology/social media enables/allows learners to learn/seek advice/help from others from diverse locations • Technical difficulties could result in missing some aspects/content of course/lack of control over access • Isolation from other learners can allow more control over learning • Isolation can result in lack of motivation/learning/progress.	6

Question	Answer	Marks
8	*Command word: Analyse: examine in detail to show meaning, identify elements and the relationship between them.* Max **two** from: • Stakeholder/client requirements are gathered at start of development • (Waterfall method) is linear/sequential/each phase follows on from/succeeds previous • Stages are analysis/requirements, design, development/implementation, testing, documentation, evaluation, maintenance Allow different names for same stages MUST HAVE AT LEAST 4 use LNK • Use of Gannt charts to plot/plan/manage development stages Max **six** from: *For:* • Most problems are detected at the initiation/analysis stages, so the time/costs of the later stages are reduced • Time is spent on planning/design at start so potential problems are resolved before the actual programming/development starts • Development is structured/controlled throughout so that deviations/alteration/amendments are minimised • ensures that the client requirements (set at start) are fully met • allows milestones to be set/used to monitor progress. Max **six** from: *Against:* • Clients may not know/fully understand their needs/requirements at the beginning/start of development project • Clients cannot see a functional prototype before/during development so may not be sure of their exact requirements • it is difficult to deviate/alter/amend them during development (because requirements are set out at the beginning/start) if the client ask for amendments/additional features during development.	**8**

Question	Answer	Marks
9(a)	*Command word: Discuss: write about issue(s) or topic(s) in depth in a structured way.* Max **six** from e.g.: *Benefits:* • All employees can share all/one of the networked printers • the number of printers can be reduced/no need for each to have own/dedicated printer • it can update users on the status of their print jobs • makes the maximum use of specialised printers/only one specialised printer is required for use by many/all employees • reduced maintenance/servicing/reduced cost of maintenance of printers as there are fewer printers • reduces costs of hardware/consumables to the company • Printers can be installed in dedicated areas/print rooms so maintenance servicing can be easier/monitored • Print jobs are queued and printed as/when a printer is available so user/client/device can carry on with other tasks • if one printer is not working/off-line another can be used • Print queues can be managed/monitored so that high priority jobs are printed first/log jobs printed at quiet times/overnight so maximising efficiency of workloads/sent to most appropriate • Printing allocations/quotas/policies can be implemented/enforced/monitored so that costs can be reduced/print jobs can be authorised/no non-company printing can occur/costs can be assigned to workers/departments/users can be alerted to completion/failure of their print job • Document security can be enforced/documents directed to specific printers/record who has printed the document. Max **six** from e.g.: *Drawbacks:* • Failure/error in/of a printer server/print queue (e.g. no paper/wrong size paper) prevents/delays printing/results in loss of print jobs to all workers/employees/users • Individual (error) messages may not be sent to (individual) users/may not know there is a printer problem • Administration of the print server must be carried out/assigned to someone so extra workload/employees are required with increased costs • Queuing/printing of large/slow print jobs in front of employees print job can reduce productivity of worker/enforce a long wait before printouts become available • Location of printers on a network may not be close/convenient for worker so has to walk/move to print room to collect document/wait for it to be delivered • Sending print job to wrong printer can result in multiple copies being printed/increased costs • Costs of installing/maintaining a print server may be excessive/too high for some companies with few employees/workstations	8

Question	Answer	Marks
9(a)	• Confidential documents can appear/be viewed on printers in open access areas. *Max 6 marks if bullets/list of points.*	
9(b)	*Command word: Evaluate judge or calculate the quality, importance, amount, or value of something.* Max **five** from e.g.: *For:* • Can transfer large quantities/gigabytes of data/large files at once • ease of use/files can be shared/transferred/sent easily/quickly by employees • Can transfer multiple directories/multiple files/whole collections of files/data can be transferred simultaneously reducing the need for employees to transfer/access separately/ease of use/less employee interaction/can carry on with other tasks • Interrupted transfers can be resumed so no need to start transfer process again reducing time spent by employee • Can schedule transfer of files at times that are convenient to employee so employee can carry on with tasks • All operating systems/laptops can use FTP so employees not restricted to one type of device/manufacturer/OS Max **five** from e.g.: *Against:* • Lacks access controls required to monitor/ensure compliance with policie so file transfer/accesses by employees are difficult to monitor • No default encryption and user IDs/passwords/files so files are vulnerable during transfer by e.g. man-in-the-middle/ attacks/hackers so data could be stolen/lost/modified by unauthorised users so is not considered a secure method of file transfer • Can be vulnerable to cyber-attack because security is weak/can be non-existent/no encryption exposing company data to unauthorised access • Hard to script jobs/transfers to have precise control over which files/when transfers are carried out • Employees can accidently delete/remove/update important files on FTP server so there is less/no control over versions of files • Difficult to configure firewalls to restrict active FTP traffic on client side/firewalls restrict FTP use of multiple TCP/IP connections so transfer times are slower in practice • Loss of FTP connection is more frequent than other connections requiring reconnections so transfer times of files may be lengthy • Has high latency due to connection-orientation which can slow transfers • Does not support date/time stamp attributes so transfers are not dated resulting in lack of audit trails. *Max 5 marks if bullets/list of points.*	**6**