



Rewarding Learning

ADVANCED
General Certificate of Education

Digital Technology

Assessment Unit A2 1
assessing
Information Systems

[ADT11]

Assessment

MARK
SCHEME

General Marking Instructions

Introduction

Mark schemes are published to assist teachers and students in their preparation for examinations. Through the mark schemes teachers and students will be able to see what examiners are looking for in response to questions and exactly where the marks have been awarded. The publishing of the mark schemes may help to show that examiners are not concerned about finding out what a student does not know but rather with rewarding students for what they do know.

The Purpose of Mark Schemes

Examination papers are set and revised by teams of examiners and revisers appointed by the Council. The teams of examiners and revisers include experienced teachers who are familiar with the level and standards expected of students in schools and colleges.

The job of the examiners is to set the questions and the mark schemes; and the job of the revisers is to review the questions and mark schemes commenting on a large range of issues about which they must be satisfied before the question papers and mark schemes are finalised.

The questions and the mark schemes are developed in association with each other so that the issues of differentiation and positive achievement can be addressed right from the start. Mark schemes, therefore, are regarded as part of an integral process which begins with the setting of questions and ends with the marking of the examination.

The main purpose of the mark scheme is to provide a uniform basis for the marking process so that all the markers are following exactly the same instructions and making the same judgements in so far as this is possible. Before marking begins a standardising meeting is held where all the markers are briefed using the mark scheme and samples of the students' work in the form of scripts. Consideration is also given at this stage to any comments on the operational papers received from teachers and their organisations. During this meeting, and up to and including the end of the marking, there is provision for amendments to be made to the mark scheme. What is published represents this final form of the mark scheme.

It is important to recognise that in some cases there may well be other correct responses which are equally acceptable to those published: the mark scheme can only cover those responses which emerged in the examination. There may also be instances where certain judgements may have to be left to the experience of the examiner, for example, where there is no absolute correct response – all teachers will be familiar with making such judgements.

Additional Guidance for Marking

Technical language is an integral part of Digital Technology as is abundantly clear from the material in the BCS Dictionary, as well as in the sets of Fact Files associated with this GCE specification. Obviously, candidates are required to be proficient with this technical language in order to understand fully the questions they are being asked. But more importantly, candidates are required to use this technical language in their responses, and to use it competently, liberally and appropriately. Paraphrasing, or the inaccurate use of the appropriate technical language will not be given credit. If they have not already done so, teachers should familiarise themselves with the Exemplification of Standards material on the Digital Technology microsite for both AS and A2. Every Chief Examiner's Report for this GCE Digital Technology specification has stressed that the most common reason why a candidate does not perform as well in the examinations as their Centres expected is because their responses have failed to reflect the required technical language.

Except when asked to list or identify an element of Digital Technology, in which case appropriate single words or phrases will be given credit, candidates are expected to answer using complete sentences. Furthermore, in assessing their candidates using the mark schemes, it is very important that teachers avoid 'cherry picking' part or parts of a mark point.

AO3 Assessment

Some questions on each paper are identified as also assessing the candidate's quality of written communication. Teachers should be aware that the standard of assessment in these questions is considerably higher than elsewhere as these questions are also part of the examination's AO3 assessment. In particular, to achieve the two higher ranges of marks in these questions, candidates must use the appropriate Digital Technology terminology accurately throughout their response, and the presentation, spelling, punctuation and grammar must be of a high standard. An important further requirement is that candidates must produce a concise and focused response as indicated by the answer space allocated – the two higher band marks will not be awarded to responses lacking in focus, or which include irrelevant material, irrespective of how the response meets the other Marking criteria.

1 (a) **Server**

Manages network resources
... such as storage/files/hardware devices/peripherals
/printers/communications/email/web
(3 × [1])

Switched hub

Acts as a single connection point for computers on a network
Checks the destination of data packets
... and forwards them to the intended recipient
... using the optimum route
(3 × [1])

Media coverter

Allows two dissimilar media types
... to connect together/
Changes the physical signals...
from one media type to another
... such as fibre optic cable and copper
(3 × [1])

[9]

(b) **MAC:** Identifies the physical address of a computer's NIC card/node on a LAN

IP: Identifies the connection address of a computer on the Internet

[2]

(c) **Peer-to-peer**

There is no dedicated/central server
All computers have equal status
Each computer is a supplier of resources
... and a consumer of resources
(2 × [1])

Server-based

One or more dedicated computers/servers
... provide resources
... for clients
(2 × [1])

Peer-to-peer maybe more suitable for a small organisation
Fewer hardware and software resources
(2 × [1])

[6]

(d) **Indicative content**

Star: A central or dedicated/host/fileserver/hub/switch
Each node is directly connected to the hub by its own cable
The fileserver controls all network communication
The fileserver controls the transfer of data packets
Ring: Each node is directly connected to two adjacent nodes
Data packets/tokens travel in one direction only

Cable Failure Comparison

Star: If a cable fails, only a single device is affected
Ring: If the cable fails, all communication is affected

[6]

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Level of response	Marking criteria	Marks
Band 2 Excellent	The candidate <ul style="list-style-type: none"> Provides a complete and accurate description of both network topologies Accurately describes the consequence of a cable failure in a star network Accurately describes the consequence of a cable failure in a ring network Uses the appropriate Digital Technology terminology accurately throughout the response Presentation, spelling, punctuation and grammar are of a high standard.	[5]–[6]
Band 1 Good	The candidate <ul style="list-style-type: none"> Provides a complete and accurate description of both network topologies Uses some relevant Digital Technology terminology Presentation, spelling, punctuation and grammar are sufficiently competent to make the response clear.	[3]–[4]
Band 0 Basic	The candidate <ul style="list-style-type: none"> Provides a description of the both network topologies which is correct but lacks some detail Makes limited use of Digital Technology terminology Presentation, spelling, punctuation and grammar are such that the intended meaning is not completely clear.	[1]–[2]

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- 2 (a) (i) A set of rules enabling different devices to communicate coherently [1]
- (ii) Presentation/Session/Transport/Network/Data link
(3 × [1]) [3]
- (iii) **Application**
Presents information/data/resources to the end user
Deals with functions such as data transfer
... messaging/distributed databases/operating system functions
... the end-user interface
Interacts with the Presentation layer
(4 × [1])
- Physical**
Converts bits and bytes/packets of data/into a physical signal
... such as pulses of light/electrical voltage
Interacts with the data link layer
(4 × [1]) [8]

(b) Similarities

Both are wireless media
Both are relatively short range

Differences

Bluetooth is a protocol
... which communicates between devices peer-to-peer
... via piconet
WiFi connects a computer to a network
... via a WAP
WiFi is more secure
(6 × [1])

[6]

(c) Parity bits

A specific bit in a byte is the parity bit/the 8th bit/LSB in a byte is the parity bit
The sum of the bits in a byte is odd if odd parity is being used/even if even parity is being used
When a byte is received its parity is checked/if the parity of the byte has changed at least one error has occurred/at least one bit has flipped.

Evaluation ‘detecting and correcting errors’

Simple parity checking can detect that an error has occurred but cannot correct it
Simple parity checking cannot detect an even number of errors
Longitudinal parity checking can detect and correct errors

[6]

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Level of response	Marking criteria	Marks
Band 2 Excellent	The candidate <ul style="list-style-type: none"> Provides a complete and accurate description of a parity bit Evaluates a parity bit with respect to detecting errors Evaluates a parity bit with respect to error correction Uses the appropriate Digital Technology terminology accurately throughout the response Presentation, spelling, punctuation and grammar are of a high standard.	[5]–[6]
Band 1 Good	The candidate <ul style="list-style-type: none"> Provides a complete and accurate description of a parity bit Uses some relevant Digital Technology terminology Presentation, spelling, punctuation and grammar are sufficiently competent to make the response clear.	[3]–[4]
Band 0 Basic	The candidate <ul style="list-style-type: none"> Provides a description of a parity bit which is correct but lacks some detail Makes limited use of Digital Technology terminology Presentation, spelling, punctuation and grammar are such that the intended meaning is not completely clear.	[1]–[2]

3 (a) **Data duplication**

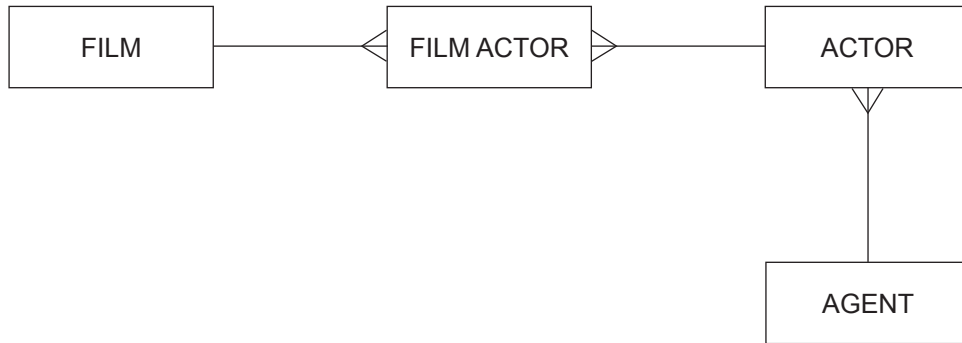
A (non-key) attribute is stored more than once in the database/table
Any suitable example such as the Title 'Mission Possible' appears twice
(2 × [1])

Data inconsistency

An attribute for an entity has more than one value
The Title for FilmID 456 has two values – 'Majority Report' and 'Minority Report'
(2 × [1])

[4]

(b)



[1] for each of four entities
[1] for each of three relationships

[7]

(c) **1NF**

FILM1(FilmID, Title)
FILM-ACTOR1(FilmID, ActorID, ActorName, AgentID, AgentName)
(2 × [1])

2NF

FILM2(FilmID, Title)
FILM-ACTOR2(FilmID, ActorID)
ACTOR2(ActorID, ActorName, AgentID, AgentName)
(3 × [1])

3NF

FILM3(FilmID, Title)
FILM-ACTOR3(FilmID, ActorID)
ACTOR3(ActorID, ActorName, AgentID)
AGENT3(AgentID, AgentName)
(4 × [1])

[9]

(d) INSERT INTO [1] EMPLOYEE [1]

VALUES [1] (MI234, John Smith, Cameraman, Full-time) [1]
(4 × [1])

[4]

(e) SELECT [1] Name, Role [1]

FROM [1] EMPLOYEE [1]
WHERE [1] Status = "Full-time" [1]
Max [4]

[4]

(f) DELETE [1] FROM [1] EMPLOYEE [1]

WHERE [1] Status = "Part-time" [1]
Max [4]

[4]

- (g) **QBE:** Provides a graphical/visual way of querying a database
 The user enters/selects values using a template/form/wizard to create a query
SQL: Is a programming language. SQL provides a set of commands to create queries
Evaluation ‘for creating queries’
 QBE users require minimum technical knowledge/skill
 SQL programming require a high level of technical knowledge/skill
 Experienced SQL programmers can create queries more efficiently
 SQL provides more comprehensive facilities for creating complex queries

[6]

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Level of response	Marking criteria	Marks
Band 2 Excellent	The candidate <ul style="list-style-type: none"> Provides a complete and accurate description of both QBE and SQL Accurately evaluates QBE for creating a query Accurately evaluates SQL for creating a query Uses the appropriate Digital Technology terminology accurately throughout the response Presentation, spelling, punctuation and grammar are of a high standard.	[5]–[6]
Band 1 Good	The candidate <ul style="list-style-type: none"> Provides a complete and accurate description of both QBE and SQL Uses some relevant Digital Technology terminology Presentation, spelling, punctuation and grammar are sufficiently competent to make the response clear.	[3]–[4]
Band 0 Basic	The candidate <ul style="list-style-type: none"> Provides a description of the both QBE and SQL which is correct but lacks some detail Makes limited use of Digital Technology terminology Presentation, spelling, punctuation and grammar are such that the intended meaning is not completely clear.	[1]–[2]

- 4 (a) Knowledge base [1]
 Contains the facts
 and rules
 ... and heuristics
 ... relating to the subject domain
 (3 × [1])
- Inference engine [1]
 Interrogates the knowledge base
 ... and draws conclusions
 Poses questions to the user
 ... and uses the answers provided
 ... to determine a suitable response
 (3 × [1])

[6]

(b) Command line

This is a text based interface

There is a pre-set list of commands

Each command is entered at a prompt and usually includes parameters and/or switches

(2 × [1])

WIMP

This is a GUI

Tasks have their own window containing icons and/or menus

A pointer is used to navigate and to select icons/menu options

(2 × [1])

Users may not be experienced in using a CLI

... and will not know the syntax of commands

They may prefer an intuitive interface provided by a WIMP

(2 × [1])

[6]

(c) Shell

This is the software development environment for creating an expert system

It contains the components of an expert system

... such as a knowledge acquisition system/knowledge base/inference engine/user interface

These components can be populated/configured for the particular application

(3 × [1])

Fuzzy logic

Uses probabilities/degrees of truth

... instead of true & false / 1 & 0 / Boolean logic / formal logic

Decisions can be made with incomplete data/uncertain data

Computers can mimic human reasoning

Fuzzy logic is designed to solve problems by making the best possible decision given the input

(3 × [1])

Heuristics

Rules of thumb

... derived from human experience/intuition

... not purely from logic

Requires judgement/estimation/evaluation

(3 × [1])

[9]

(d) Improved quality of surgery

... because robots work consistently

(2 × [1])

Leads to better productivity/more operations

... because robots can work faster than humans/can be reprogrammed/
remote surgery is possible

(2 × [1])

Improved quality of surgery

... because robots produce error free work/can work accurately

(2 × [1])

Using robotic surgery, surgeons can perform delicate and complex procedures

... that may have been difficult or impossible with other methods

(2 × [1])

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	<p>Robotic surgery makes minimally invasive surgery possible/tiny incisions ... resulting in fewer complications, such as surgical site infection, less pain and blood loss (2 × [1]) Max [4]</p>	[4]
	<p>(e) Surgical robots are costly to maintain... and their operation requires additional training (2 × [1]) Reliance on the technology working/possibility of malfunction/unexpected events ... which is critical during surgery (2 × [1]) No tactile feedback ... can cause complications (2 × [1]) Max [4]</p>	[4]
5	<p>(a) A microphone within the mobile phone ... picks up the analogue/voice signal and converts it to a digital signal/pattern Using an ADC/sampling The digital signal/pattern is compared ... to a database/library of stored sounds/patterns (4 × [1])</p>	[4]
	<p>(b) Base station controller Controls one or more base stations/provides an interface between cells Responsible for call set up ... and handover management Works with a mobile switching centre ... providing voice pathways for mobile phones and other compatible devices, such as a land line or the Internet. (2 × [1])</p> <p>Handoffs When a network automatically switches coverage responsibility from one base station to another ... as a user making a call moves between cells (2 × [1])</p> <p>Cells Small hexagonal areas ... with their own mast ... and base station Strategically placed ... to ensure maximum coverage (2 × [1])</p>	[6]
	<p>(c) Differential backup Copies all data files which have altered since the last full backup (2 × [1])</p> <p>Incremental backup Copies all data files which have been altered since the last backup (2 × [1])</p>	[4]
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- (d) The use of the internet/server farms
 ... by large computing companies
 ... to provide services ... normally provided by a LAN
 (4 × [1]) [4]
- (e) **Virtualisation**
 Virtual servers
 ... run on physical server platforms
 Multiple OS/applications can run on the same server
 (2 × [1])
- Clustering**
 Clusters of dedicated hardware
 ... are hosted at each data centre
 ... to provide specialised services/processes for clients
 (2 × [1]) [4]
- (f) All data is stored on server farms/virtual servers/remote servers
 ... and can be accessed using an Internet connection
 (2 × [1])
 Reduced hardware/software (investment) costs/maintenance costs
 ... as these costs are borne by the service provider
 (2 × [1]) [4]
- (g) Availability risk/Dependent on internet connection
 Security risks/lack of control at the provider
 Unauthorized access to customer data
 (2 × [1]) [2]
- (h) **Personal data must be**
 Fairly and lawfully processed
 Processed for limited/specified/lawful purposes
 Adequate, relevant and not excessive
 Accurate/up to date
 Not kept for longer than is necessary
 Processed in line with the rights of the data subjects
 Kept secure
 Not transferred to other countries without adequate protection
 (4 × [1]) [4]
- (i) **Data Subject**
 The person/individual
 ... about whom personal data is stored
 (2 × [1])
- Information Commissioner**
 Responsible for enforcing the Act/appointed by the Government
 Promotes good practice for the responsible processing of personal data
 Informs the general public about their rights under the Act
 Maintains a register of organisations storing personal data
 (2 × [1]) [4]

Total

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150