



Rewarding Learning

ADVANCED
General Certificate of Education
2024

Digital Technology

Assessment Unit A2 1

assessing

Information Systems

[ADT11]

FRIDAY 14 JUNE, AFTERNOON

**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.

1 (a)

| Network user | Network | Communication medium |
|--|--------------------|-----------------------|
| University campuses spread over a city | Metropolitan | Fibre optic/wireless |
| International supermarket chain | Wide area network | Fibre optic/satellite |
| School office | Local area network | Cable/wireless |

6 × [1]

[6]

(b) **Repeater**

Regenerates

- ... data transmission signals
- ... that have been attenuated
- ... by travelling over long distances

3 × [1]

Wireless access point

A device that allows a Wi-Fi enabled device

- ... to connect to a network
 - ... using radio transmitters/antennae
 - ... usually by connecting to a router
- Wi-Fi hotspots use a WAP to support their Wi-Fi coverage area

3 × [1]

Media converter

Allows two dissimilar media types/protocols

- ... to connect together
- Changes the physical signals... from one media type to another
- ... such as fibre optic cable and copper

3 × [1]

[9]

(c) IP address

other devices on the Internet

MAC address

network interface card (NIC)

4 × [1]

[4]

| AVAILABLE MARKS |
|-----------------|
| |

(d) Star topology

Has a central or dedicated/host/fileserver/hub. Each node is directly connected to the hub by its own cable

The hub controls all network communication by controlling the transfer of data packets

If a node wishes to communicate with another node, this is done via the hub.

Bus network

All nodes are connected directly to a main cable called the backbone by its own cable/spur

Data can be transmitted in both directions along the backbone

A node transfers data directly to another node by putting it onto the backbone

Terminators are placed at each end of the backbone to prevent the signals from reflecting off the end of the cable

A collision occurs when two nodes try to send a message at the same time

To avoid collisions CSMA/CD is used

Evaluation: Adding a node

Star Adding a new node is relatively straightforward

The new node is simply connected to the hub by a cable provided there is a spare port

Bus Adding a new node is very straightforward

The new node is simply connected to the backbone by a cable. Adding more nodes may slow transmission speeds due to increased traffic volumes.

| Level | Marking Criteria | Marks |
|--------|--|---------|
| Band 2 | <p>The candidate</p> <ul style="list-style-type: none"> Provides a detailed description of each topology which is correct Evaluates both topologies wrt adding a new node Uses the appropriate Digital Technology terminology accurately throughout the response <p>Presentation, spelling, punctuation and grammar are of a high standard.</p> | [5]–[6] |
| Band 1 | <p>The candidate</p> <ul style="list-style-type: none"> Provides a detailed description of each topology Describes the impact of adding a new node for one topology Uses some relevant Digital Technology terminology <p>Presentation, spelling, punctuation and grammar are sufficiently competent to make the response clear.</p> | [3]–[4] |
| Band 0 | <p>The candidate</p> <ul style="list-style-type: none"> Provides a description of each topology which lacks detail Makes limited use of Digital Technology terminology <p>Presentation, spelling, punctuation and grammar are such that the intended meaning is not completely clear.</p> | [1]–[2] |

[6]

25

2 (a) Transport
Network
Data
Physical
4 × [1]

[4]

(b) **Bluetooth**

Allows Bluetooth-enabled devices to communicate peer-to-peer
... over ranges from 10 m to 100 m (Class 3 and 1)
... within ad hoc networks called piconets
The device wishing to pair will display the devices within range
... provided have been set to visible
A passcode may be required
3 × [1]

Wi-Fi

Connects a computer fitted with a wireless adapter
... to a network via a WAP
... within a hotspot/a short distance, e.g. 60 m/90 m
A Wi-fi network can either be 'open'
... or 'closed' needing a password
3 × [1]

[6]

(c) **Bandwidth**

Bandwidth is a measure of the capacity of a communication channel
It is the range of a frequencies available
Bandwidth may be a frequency range, e.g. 3 kHz/measured in Hz
... or a transmission rate, e.g. 64 kbps or line speed, e.g. 64 k
2 × [1]

Broadband

Broadband is wide bandwidth data transmission
... handling multiple signals and traffic types
Refers to high-speed Internet access that is always on
The popular name for Internet connection using DSL/co-axial/fibre
Used to describe a bandwidth in excess of 3 kHz/more commonly in
excess of 300 MHz/Cat 6 speeds 16bps
2 × [1]

[4]

AVAILABLE
MARKS

(d) Wireless technology

Wireless covers a range of possible methods of data transmission using radio waves

Bluetooth for short ranges using low power radio waves to connect devices

Wi-Fi to connect computers to a LAN

Metal cable

Copper cabling is used to transmit electrical signals over relatively short distances

Types: coaxial cable/twisted pair/unshielded twisted pair

Shielding: protects the signal from interference

Evaluation: volume of data transfer

Wireless

Bluetooth: up to 25Mbps, low bandwidth

Wi-Fi: up to 250Mbps+, high bandwidth

Metal cable

Twisted pair: 100Kbps to 100Mbps, low bandwidth

Co-axial: up to 10Mbps, higher bandwidth

| Level | Marking Criteria | Marks |
|--------|---|---------|
| Band 2 | <p>The candidate</p> <ul style="list-style-type: none"> Provides a detailed description of each data transmission medium which is correct Evaluates both data transmission mediums wrt volume of data transfer Uses the appropriate Digital Technology terminology accurately throughout the response <p>Presentation, spelling, punctuation and grammar are of a high standard.</p> | [5]–[6] |
| Band 1 | <p>The candidate</p> <ul style="list-style-type: none"> Provides a detailed description of each data transmission medium which is correct Describes typical data transmission volume of one technology Uses some relevant Digital Technology terminology <p>Presentation, spelling, punctuation and grammar are sufficiently competent to make the response clear.</p> | [3]–[4] |
| Band 0 | <p>The candidate</p> <ul style="list-style-type: none"> Provides a description of each data transmission medium which lacks detail Makes limited use of Digital Technology terminology <p>Presentation, spelling, punctuation and grammar are such that the intended meaning is not completely clear.</p> | [1]–[2] |

[6]

| | | AVAILABLE MARKS |
|----------|--|-----------------|
| (e) (i) | 00011011₂ | [1] |
| (ii) | A copy of the received byte will be sent to the sending device and checked against the original If an error is detected, the byte will be re-transmitted 2 × [1] | [2] |
| (iii) | Even parity is being used ... as the number of ones in the byte before transmission is even The received byte still has even parity because of the double flip The double error will not be detected 4 × [1] | [4] |
| 3 | (a) primary repeating attributes partial non-key/transitive 5 × [1] | [5] |
| (b) | Composite key Consists of more than one attribute Uniquely identifies ... an entity occurrence/record 3 × [1] | |
| | Referential integrity A foreign key ... must correspond to a valid/existing primary key ... in another table 3 × [1] | [6] |
| (c) | 1NF EMPLOYEE (EmployeeID , EmployeeName, EmployeeEmail) EMPLOYEE-COURSE (EmployeeID , CourseID , CourseTitle, CompletionDate, TutorID, TutorName) 2 × [1] | |
| | 2NF EMPLOYEE unchanged [1] EMPLOYEE-COURSE (EmployeeID , CourseID , CompletionDate) COURSE (CourseID , CourseTitle, TutorID, TutorName) 2 × [1] | |
| | 3NF EMPLOYEE and EMPLOYEE-COURSE both unchanged [1] COURSE (CourseID , CourseTitle, TutorID) TUTOR (TutorID , TutorName) 2 × [1] | [8] |
| | | 27 |

| | | AVAILABLE MARKS |
|-----|---|-----------------|
| (d) | [1] for composite entity EMPLOYEE-COURSE [1] for the other three entities EMPLOYEE, COURSE and TUTOR 3 × [1] for each of the three relationships | [5] |
| (e) | A many to many relationship between Tutor and Course ... requiring a new Course-Tutor entity 2 × [1] | [2] |
| 4 | (a) (i) INSERT [1] INTO AUTHOR [1] VALUES [1] (A1493, Diggy Tech, 12345) [1] 4 × [1] | [4] |
| | (ii) SELECT [1] BookID, Title [1] FROM [1] BOOK [1] WHERE [1] Format = "Hardcopy" [1] Max [4] | [4] |
| | (iii) Relevant details will be selected or inserted using a grid/template/ wizard/dialogue box The BOOK table will be selected The fields to be displayed will be selected i.e. BookID and Title The search criteria will be entered i.e. Format equal to Hardcopy 4 × [1] | [4] |
| (b) | A neural network consists of artificial neurons or units ... arranged in layers Each unit is usually connected (one-way/two-way) to every other unit in the layers on either side Input units receive information from the outside world ... and attempt to process input from the input units Output units provide a response representing what it has learned from processing the input Backward propagation may be used Each connection is weighted ... and algorithms are used to calculate the weighted sum of any inputs ... to generated an output value 6 × [1] | [6] |
| | | 26 |

- (c) (i) The consultants are the experts
 ... providing their knowledge
 ... and the rules
 ... and heuristics they use
 ... in calculating insurance policies/premiums
 ... and the decision-making involved
 ... to the expert system designer
 ... during the design of the expert system
 6 × [1] [6]

(ii) **Features**

The expert system will ask the user a series of questions and follow-up questions about their health and lifestyle – age, gender, smoking status, health

... and use the answers with its inference engine and knowledge base
 ... to calculate the appropriate insurance quotation

Evaluation: More accurate premiums

The expert system can rapidly produce a quotation which is very accurate and consistent, and can provide reasoning and alternatives

The quotation will be based on the experience of a large number of insurance consultants

There is a risk of over reliance on technology

Insurance consultants may become deskilled

An insurance consultant can take into account special circumstances which the expert system may overlook

| Level | Marking Criteria | Marks |
|--------|---|---------|
| Band 2 | <p>The candidate</p> <ul style="list-style-type: none"> Provides a detailed description of an expert system in life insurance quotations which is correct Evaluates the use of an expert system in life insurance quotations Uses the appropriate Digital Technology terminology accurately throughout the response <p>Presentation, spelling, punctuation and grammar are of a high standard.</p> | [5]–[6] |
| Band 1 | <p>The candidate</p> <ul style="list-style-type: none"> Provides a detailed description of the use of an expert system in life insurance quotations which is correct Uses some relevant Digital Technology terminology <p>Presentation, spelling, punctuation and grammar are sufficiently competent to make the response clear.</p> | [3]–[4] |
| Band 0 | <p>The candidate</p> <ul style="list-style-type: none"> Provides a description of the use of an expert system in life insurance quotations which lacks detail Makes limited use of Digital Technology terminology <p>Presentation, spelling, punctuation and grammar are such that the intended meaning is not completely clear.</p> | [1]–[2] |

[6]

30

5 (a) Natural language processing system

NLP is concerned with the ability of a computer to be able to understand human interaction

... in natural spoken or written form

It is the ability of a machine to analyse, understand and generate human speech

... thus making interactions between humans and computers 'human-like'

2 × [1]

Voice recognition system

A combination of hardware and software with the ability to decode spoken commands

... to operate devices or execute commands without the need to the use of peripherals such as keyboards, mice or tracker pads for example

2 × [1]

[4]

(b) A Cell

Consist of hexagonal areas

... each with its own mast

... and base station

These are strategically placed

... to ensure maximum coverage

3 × [1]

A base station controller

Controls one or more base stations/provides an interface between cells

Is 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

3 × [1]

[6]

(c) Data mining analyses large data sets to discover patterns

The shopping habits/preferences/financial details data

... which is stored about a customer

... could be used for unauthorised purposes/purposes for which the customer has not given permission

... or for purposes unknown to the customer

4 × [1]

[4]

(d) Clustering

Clustering involves a group of virtual servers

... hosted at a data centre

... providing cloud computing services

... using load balancing/parallel processing (to meet real-time demand)

3 × [1]

Hosted solution

The hardware and software required by an individual client

... are provided on a remote server

... and always available for that client to use

No other client can access them

3 × [1]

[6]

20

- 6 (a) (i) Data subject**
 The person/individual
 ... about whom personal data is stored
 2 × [1]
- Data controller**
 The nominated person within an organisation
 ... who determines the purposes
 ... for which personal data is stored/processed
 Informs employers about their responsibilities under the Act
 2 × [1] [4]
- (ii) Personal data must be:**
 Fairly and lawfully processed
 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]
- (b) (i) CMA crimes**
 Unauthorised access with intent to commit or facilitate commission of further offences
 2 × [1] [2]
- (ii)** The organisation CMA/AU policy should ensure
 ... that employees are aware of their obligations under the Act
 2 × [1]
- IT use by employees should be audited regularly
 ... and suspect access activity be investigated
 2 × [1]
- Implementing a username and password system
 ... to control/restrict employee access to computer systems
 2 × [1] [6]
- (c) Automated decision making**
 Those involved in decision making systems should be accountable for decisions
 Decisions should be monitored
 ... for bias
 ... errors
 ... fairness
 Decisions should be explained/the process should be transparent
 Data used for decision making should be collected and used legally
 3 × [1]
- Monitoring personal behaviour**
 They should establish a detailed workplace monitoring policy
 They should ensure transparency in monitoring
 They should limit the scope of monitoring/obtain consent/ensure confidentiality
 State clearly the purpose of monitoring/Identify who and what is monitored
 Identify who performs the monitoring

Explain how staff will be informed about monitoring
They must keep the data collected secure
3 × [1]

[6]

Total

**AVAILABLE
MARKS**

22

150