Pearson Edexcel

Mark Scheme (Results)

Summer 2023

Pearson Edexcel International Advanced Level In Information Technology (WIT11) Paper 01

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Unit 1 2306 – Mark Scheme

Question number	Answer	Additional guidance	Mark
1(a)(i)	Award **one** mark for any of the following: • The legal right granted to a creator to exclusively publish/sell/distribute the artefact/music/book/painting (1) • Work cannot be reused (legally) without the owner's/creator's permission (1) • The owner/publisher/creator has exclusive control over the work (1) • Protects work from being used without the owner's/creator's permission (1)	There has to be some indication of exclusive ownership Do not award responses indicating that copyright prevents/stops copying Do not award responses that describe how copyright is broken, e.g. using someone's work without permission	1

Question number	Answer	Additional guidance	Mark
1(a)(ii)	Award **one** mark for each correct cell: **Situation** / **Legal issue** A member of staff uses the magazine editor's password to access the editor's emails — Computer misuse (1) The individual responses of readers from a 1983 survey are stored in a warehouse — Data protection/storage (time) limitation (1) The new magazine logo is found online and copied by another organisation — Trademark/Intellectual property/IP (1)	Award hacking/unauthorised access for computer misuse Award data protection as responses indicated time limitation/out-of-date data Allow copyright for last cell instead of trademark Do not award creative commons for last cell instead of trademark	3

Question	Answer	Additional guidance	Mark

number			
1(b)(i)	Award **one** mark for any of the following: • To prevent criminals from making use of any data they may (fraudulently) acquire (1) • Only people with the key can decrypt/understand/access the data (1) • The data cannot be **understood** by unauthorised people (1)	Do not award responses that only indicate the data cannot be read Award decrypting/decoding, only when associated with using a key	**1**

Question number	Answer	Additional guidance	Mark
1(b)(ii)	The only correct answer is **D** ***A*** *is not correct because a firewall is a component of network security* ***B*** *is not correct because media access control is an addressing mechanism* ***C*** *is not correct because pay per click is a monetisation mechanism used in HTML pages*		**1**

Question number	Answer	Additional guidance	Mark
1(c)(i)	Award **one** mark for any of the following up to a maximum of **two** marks: • Validation of data values inputted into boxes by the user (1) • Executing actions based on click of buttons/hotspots (1) • Updating a displayed page based on a timer/clock (1) • Sending requests for web pages to web servers (1) • Running games/animations that use Flash plug-ins (1) • Handling cookies (1) • Rendering pages received from web servers (1) • Adjusting the appearance of a web page to match the device on which it is being displayed (1)	Accept examples that can be matched to a unique bullet, e.g. form processing/interactivity could be Bullet 1 or Bullet 2 Do not award displaying as rendering	**2**

Question number	Answer	Additional guidance	Mark
1(c)(ii)	Award **one** mark for any of the following up to a maximum of **two** marks: • Building a dynamic HTML/web page (1) • Querying a database to display results on a web page (1) • Checking login credentials (1) • Fulfilling requests sent by clients / processing forms (1) • Updating RSS feeds (1)	Accept examples that can be matched to a unique bullet Do not award 'provide data', unless explained to show it involves a dynamic process	**2**

Question number	Answer	Additional guidance	Mark
1(d)	Award **one** mark for each of the following: • Minutes to seconds (7 × 60) (1) • Speed to bits per second (50.4 × 1000 × 1000) (1) • Bits to gibibytes (8 × 1024 × 1024 ×1024) (1) • Division used in solution, as long as 50.4 is in the numerator and 8 is in the denominator (1) Example: $\frac{(7 \times 60) \times (50.4 \times 1000 \times 1000)}{8 \times (1024 \times 1024 \times 1024)}$ Example: $\frac{(7 \times 60) \times (50.4 \times 10^6)}{8 \times 2^{30}}$ Example: $\frac{21168 \times 10^6}{8 \times (1024 \times 1024 \times 1024)}$ Example: $\frac{420 \times 50.4 \times 10^6}{8 \times (1024 \times 1024 \times 1024)}$	Award marks independently Award all equivalent expressions Award one mark for 2.46 or 2.5 with no expression Only allow one duplicate of 50.4 or 8 in wrong place	**4**

Total for question 1 = 14 marks

Question number	Answer	Additional guidance	Mark
2(a)	Award **one** mark for any of the following up to a maximum of **two** marks: • Speed/clock speed/MIPs/execution time/number of cores (1) • Capacity/memory/(secondary/primary) storage (1) • Portability (1) • Bandwidth/throughput (1) • Power efficiency/battery life (1) • Reliability (1)	Award lag/latency as equivalent to execution time/speed	**2**

Question number	Answer	Additional guidance	Mark
2(b)	Award **one** mark for any of the following up to a maximum of **two** marks: • Hardware/HW/Devices/Device (1) • Software/SW/Programs (1) • Process/Processes/Processing (1)	Do not award processors	**2**

Question number	Answer	Additional guidance	Mark
2(c)(i)	Award up to **two** marks for a linked explanation, such as: • A GPS device can be used to track the location of the search dog (1) so that when the dog finds the hiker the rescuers know where to go (1) • A rescuer can locate the dog when it is out of sight (1) because its position can be determined from the GPS device (1) • Track the GPS device (worn by the dog) (1) to find the person's location (1)	Do not award responses assuming that the lost person has a functional GPS device Can assume that dog and lost person are together Do not award responses about the general characteristics or functions of GPS	**2**

Question number	Answer	Additional guidance	Mark
2(c)(ii)	Award **one** mark for any of the following up to a maximum of **two** marks: • Sensors/altimeter/gyroscope (1) • Actuators/motors (for rotor blades) (1) • Cameras (still, video, thermal) (1) • Speaker/microphone/audio (1) • Battery/power supply (to drive motors) (1) • Radio frequency/wireless communications (1) • Microprocessor/(on-board) computer (1) • On board memory/storage (1)	Allow remote control for radio communications Do not award embedded system	**2**

Question number	Answer	Additional guidance	Mark
2(d)	Award up to **two** marks for a linked explanation, such as: • Sensors are/IT is used to monitor rainfall (1) so that floods/mudslides can be predicted (1) • Sensors are/IT is used to monitor windspeed (1) so that warnings can be issued (1) • Sensors are/IT is used to monitor pollen levels (1) so that visitors with allergies can be advised not to visit (1) • Sensors are/IT is used to monitor UV levels (1) so that visitors can be advised to wear sunscreen (1) • A network of wireless sensors is used to measure/monitor the condition of rock faces (1) so that rock falls can be predicted (1) • A network of wireless sensors is used to monitor changes in glaciers and snow coverage (1) so that the impact of global warming is better understood (1) • Communication device with attached wind generator could be used (1) so that walkers could report emergencies (1)	Allow valid responses outside the context of mountains Do not award general impacts, such as 'to inform people' or to 'know about the data' alone Use of sensor may be implied	**2**

Total for question 2 = 10 marks

Question number	Answer	Additional guidance	Mark
3(a)	Award **one** mark for any of the following up to a maximum of **two** marks: • Barcode/scanner/reader (1) • RFID/Radio Frequency Identification/Radio Frequency Identifier • Card/chip and pin/magnetic stripe/NFC/Nearfield Communication Technology (1) • Printer (1) • Scale (1) • Display/LCD/Monitor/Screen (1) • Keyboard/keypad (1) • Biometric (1)	Do not award infrared devices	**2**

Question number	Answer	Additional guidance	Mark
3(b)(i)	Award **one** mark for any of the following up to the maximum of **two** marks: • Loads device driver software for the device into memory (1) • Passes data/requests between software applications and the device (1) • Handles interrupts from the device so that data is not lost (1) • Monitors the status of the device (1) • Identifies the (type of) / detects the device (1)	Accept any order Award mp2 for idea of operating system taking input from and giving output to peripherals, but not users	**2**

Question number	Answer	Additional guidance	Mark
3(b)(ii)	Award **one** mark for any of the following up to the maximum of **two** marks: • Allocates each process the memory that is required for it to run (1) • Ensures that one process does not use the memory space allocated to a different process/does not interfere with other processes (1) • Frees up memory when the process is finished (1) • Gives each process a time slice/turn at using the CPU (1) • Ensures that every process has an equal chance to run in the CPU/has a chance set by its priority/is held in a queue while waiting (1)	Accept any order	**2**

Question number	Indicative content.	Mark
3(c)	**Take payment** • A coin sorter is needed so that the inputted coins can be separated. • A note reader is needed so that the value of the inputted notes can be known. • A display is needed so that the customer can be told how much money has been inputted. **Select product** • A keypad is needed so that the customer can enter a product code. • A display is needed so that the customer can be told if the code is invalid. • A display is needed so that the customer can be told that not enough money has been inputted. • A sensor is needed so that an empty product can be known. **Inform user** • LCD display – to show the selection code/price of items/amount of money deposited/if an item is not available **Supply product** • An actuator/motor is needed so that the product can be pushed forward. • A scale at the bottom takes a reading to see if a product is dropped • A display is needed so that the customer can be told that the product is ready. **Give change** • A process to calculate the change is needed so that the customer receives the correct amount. • A coin sorter is needed so that the correct value of coins is returned as change. • A display is needed so that the customer can be told the amount of change being returned. **Process control** • The vending machine uses one or more microprocessors. • Programs are run to determine which actions are to be activated.	**6**

	Example: The embedded system makes use of several components to execute these tasks and these components come into play at different parts of the process. The customer inserts money into the machine which goes through a reader that identifies the sum of money and this data is stored in temporary storage for the steps that follow. The customer then types in a product code on the keypad and the OS attributes it to the corresponding data stored in the memory of the machine for the same product. The sum of money and the cost of the product are input into the processor which calculates whether the sum of money is sufficient or not and calculates the change due. If the output from the processor states that the money is sufficient then an input is triggered to the motors that push the product forward. The sum of change calculated by the processor is interpreted by the machine and the right amount of change is dispensed through a trapdoor-like mechanism.	

Level	**Mark**	**Descriptor**
	0	No rewardable material.
Level 1	1-2	• Demonstrates limited knowledge and understanding, some of which may be inaccurate. • Applies understanding with limited coherence to produce a response that lacks development.
Level 2	3-4	• Demonstrates knowledge and understanding, which is mostly relevant and may include some inaccuracies. • Applies understanding to make some coherent connections and a partially developed response.
Level 3	5-6	• Demonstrates accurate and relevant knowledge and understanding throughout. • Applies understanding coherently to produce a fully developed response.

Total for question3 = 12 marks

Question number	Answer	Additional guidance	Mark
4(a)	The only correct answer is **B** ***A*** *is not correct because a* ***hub*** *operates at layer one (physical layer)* ***C*** *is not correct because a* ***gateway*** *operates at layer three (network layer) and joins dissimilar networks, e.g. different protocols* ***D*** *is not correct because a* ***router*** *operates at layer three (network layer) and holds information (IP addresses) and forwards data along an appropriate route*		**1**

Question number	Answer	Additional guidance	Mark
4(b)	Award up to **two** marks for a linked description (comparison) such as: • Bandwidth is the total amount/capacity of data that can pass through the network in a given time (1), whereas speed is a measurement of the actual rate of transfer in a given time (1) • Bandwidth is the theoretical maximum amount of data that can be transferred per second (1), whereas speed is the actual amount of data transferred per second (1) • Bandwidth is how much data can be transmitted at one time (1), whereas speed is how fast the data is being transmitted (1)	Candidates might not refer to "in a given time" in both parts of their answer Award transmission rate for speed Do not award packets as equivalent to data/bits	**2**

Question number	Answer	Additional guidance	Mark
4(c)	Award **one** mark for any of the following up to a maximum of **three** marks: • Data is stored on hard drives, connected to servers/(own) server farms/remote servers (1) • Owned and managed by commercial/private organisations (1) • Data on the cloud storage is secured/backed up by the provider (1) • Small capacity provided for free (1) • Storage capacity can be increased on demand/for a fee (1) • Only available through an Internet connection (1)	Allow network/Wi-Fi/online, even if not qualified, as having access to the Internet	**3**

<table>
<tr><th>Question number</th><th>Answer</th><th>Additional guidance</th><th>Mark</th></tr>
<tr><td>4(d)</td><td>Award one mark for each two correct cells:

<table>
<tr><th>Situation</th><th>Connectivity</th><th>Medium</th><th>Signal</th></tr>
<tr><td>Computers and printers in a school share the same servers</td><td>Wired</td><td>Copper</td><td>Electrical</td></tr>
<tr><td>A laptop communicates with a wireless access point</td><td>Wireless/Wi-Fi</td><td>Air</td><td>Radio (waves)</td></tr>
<tr><td>Two towns on either side of the Atlantic Ocean are connected</td><td>Wired</td><td>Fibre-optic</td><td>Light</td></tr>
<tr><td>An artificial satellite beams signals to receiving dishes mounted on houses</td><td>Wireless</td><td>Air/space</td><td>Microwaves</td></tr>
<tr><td>Appliances in the home are connected to each other</td><td>Wired</td><td>Powerline</td><td>Electrical</td></tr>
</table>

Electromagnetic spectrum includes both radio waves and microwaves. It is a general term.
Radio waves are a lower frequency than microwaves.
Radio waves are used by laptops for communication.
Microwaves are higher frequencies on the radio frequency spectrum.
Microwaves are used by satellites to communicate with earth-based stations.

The values in each row must work together. For example, appliances in the home can connect with Zigbee, but Zigbee does not run over a Powerline/copper medium.</td><td>Award ‘fibre’ and ‘radio’

Allow low voltage cable/Ethernet cable/Powerline/Twisted Pair as an alternative to copper

Allow fibre/optical as an alternative to fibre optic

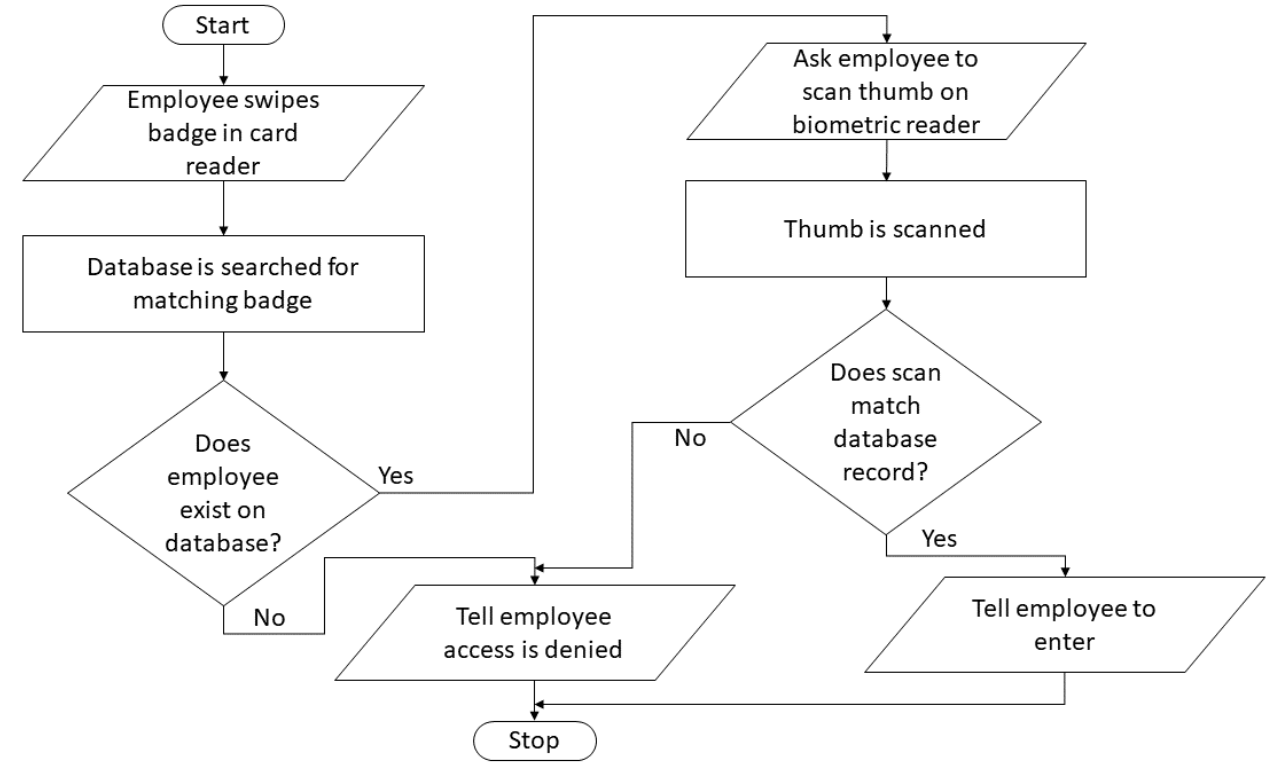
Do not award 'nothing' for Air or Space

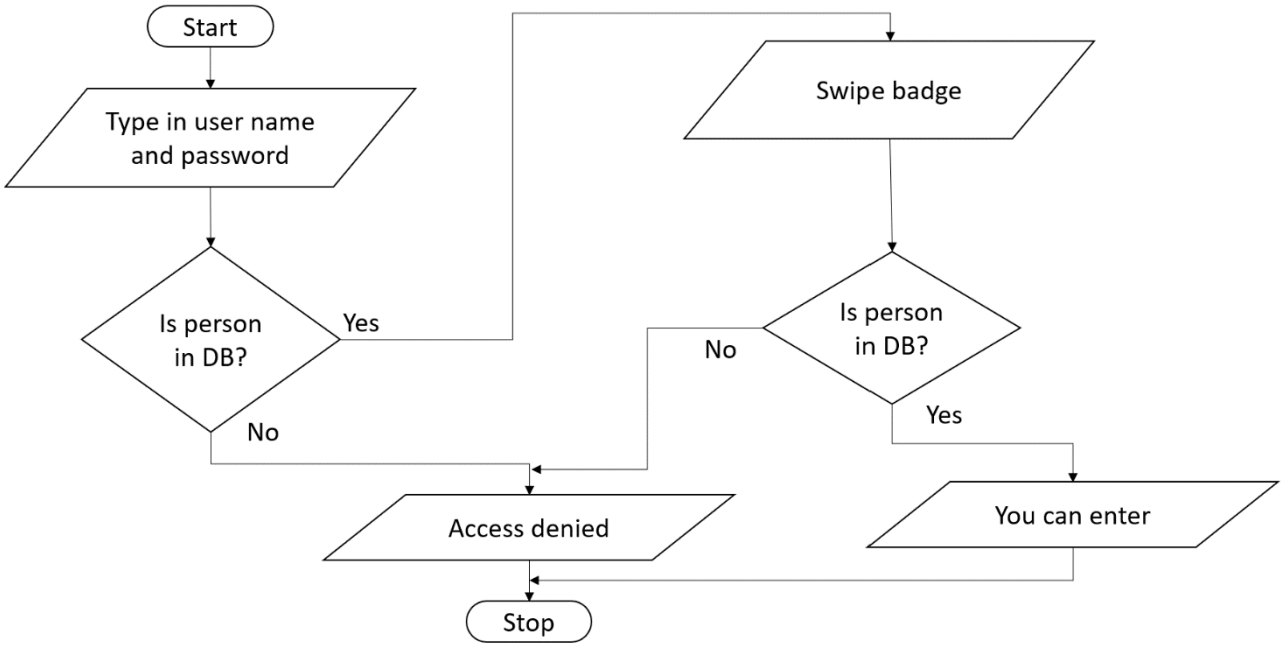
Do not award electromagnetic waves in the medium column

In any cell, if there are multiple responses, only the first can be marked, unless the following term modifies the first, such as electromagnetic/radio or electromagnetic/micro wave</td><td>6</td></tr>
</table>

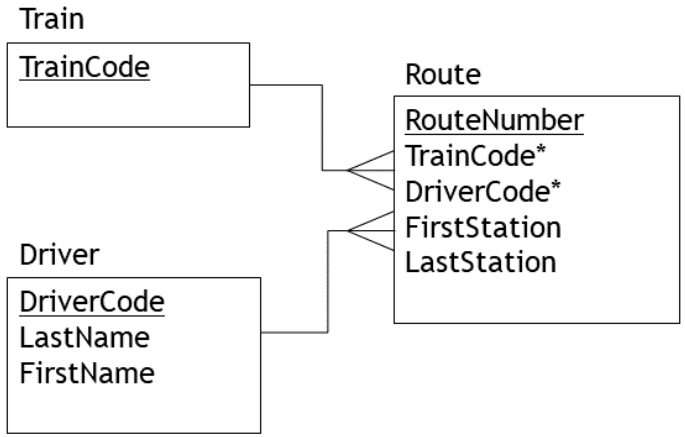
Total for question 4 = 12 marks

Question number	Answer	Additional guidance	Mark
5(a)	Two-factor authentication requires that each step be one of: • What the employee knows • What the employee has • What the employee is Each factor described in the flowchart must map to one of those categories and **be a different category from the other.** Award **one** mark for any of the following: **Logic of the problem** • First step in authentication being what the employee knows, what the employee has, or what the employee is (1) • Checks database holding records for first authentication method (1) • Second step in authentication being what the employee knows, what the employee has, or what the employee is, **as long as it is a different type of authentication to step 1** (1) • Checks database holding records for second authentication method (1) • Results from the decisions (regardless of shape) must lead to sensible output messages/sensible actions (such as going back to start) (1) • Provides a fully functional logical solution to the problem (1) **Use of annotation regardless of logic** • Has a single start/begin and a single stop/end symbol (1) • At least one decision (regardless of shape) has exactly one input and exactly two outputs with Yes and No labels (1) • Fully connected with arrows/lines (no hanging symbols, no extra lines) (1) • Accurate and correct symbols (Appendix 7) used throughout a reasonable attempt at the problem solution incorporating two forms of identity that could be used for 2-factor identification (1) Example for full marks:	Do not award SMS or code by mobile for bullet 1 or bullet 2, as it is disallowed in the question. Authentication factors can be in any order. Flowchart symbols are provided in Appendix 7 of the specification. Ignore any attempt to determine if employee has mobile phone. Allow True/False for Yes/No Allow query to mean query a database Award fully connected (mp9) as a follow through, if there are no start/stop boxes (mp7)	**10**





Question number	Answer	Additional guidance	Mark

5(b)	Award up to **four** marks for:
	• An appropriate name for the provided entity (1)
	• A single primary key (underlined) with an appropriate name (1)
	• Two foreign keys only (asterisk) (1)
	  ○ TrainCode/a name identifying the train
	  ○ DriverCode/a name identifying the driver
	• Two one-to-many relationship (1)
	  ○ from Train to the new entity
	  ○ from Driver to the new entity
	
	Example:
	
	 
	
		Ignore any extra fields added to any entity
		
		Ignore omission of any non-key fields
		
		Ignore extra relationship lines
		
		Award bullet 2 as follow through, when primary key name follows inappropriate entity name
		
		Do not award **station** as entity name
			4

Question number	Answer	Additional guidance	Mark
5(c)	Award **one** mark for each correct part of the query up to a maximum of four marks. • Delete keyword (1) • From tbl_arrival (1) • Where sourceStation (1) • Use of appropriate wildcard (OHS% , OHS*, OHS_ _ _) (1) Examples: DELETE FROM tbl_arrival WHERE sourceStation LIKE 'OHS%'; DELETE * FROM tbl_arrival WHERE sourceStation LIKE 'OHS*'; DELETE FROM tbl_arrival WHERE sourceStation = 'OHS___'	Award marks with minor errors in syntax as long as the intent is clear. Award lines out of order. Ignore any items after DELETE. Ignore missing quotes Ignore semi-colon, if provided Ignore capitalisation Allow = or == for LIKE Ignore any additional lines	**4**

Total for question 5 = 18 marks

Question number	Answer	Additional guidance	Mark
6(a)	Award up to **two** marks for a linked explanation such as: • A DFD can be used as a planning/management/decision-making tool for a system (1) because it shows how data is processed as it moves through the system (1) • A DFD can be used as a communication method (1) because the designers and the implementors of a system need a common language (1) • A DFD can be used as presentation tool (1) because it is a visual/non-complex/simple-to-understand representation of how data moves through a system (1) • A DFD can be used as a design / monitoring tool (1) because it shows decomposition of a solution into processes (1) • A DFD can be used to identify bottlenecks / areas for improvement in a system (1) because it provides a graphical representation of the processes involved and how data flows between them (1) • A DFD is easy to understand (1) because it shows processes/flow between processes (1)	The explanations in the mark scheme should be used as indicative types of usage of DFDs. Do not award examples in business.	**2**

Question number	Indicative content	Additional guidance	Mark
6(b)	**Data collected by the bus company** • The bus company will have data about each of the stations/stops it maintains, such as address, amenities, and maintenance logs. • The bus company will have data about each of its employees, such as name, birthdate, salary, and working hours. • The bus company will have data about each of the buses, such as make, model, type, manufacturer, date of manufacture, maintenance schedules, and fault logs. • The bus company could collect information about its customers, such as age, frequency of travel, and most popular routes. • The bus company must ensure that the data is secure and ensure that it is stored and processed in line with legislation. **Benefits of structuring the bus company data** • The structured data, stored in a relational database, can be queried to identify new information, such as punctuality of buses and personnel. • The structured data in the database exists only in one place, so when information changes, such as the name of an employee, the data only needs changing in one place. • The entire database can be backed up as a single entity and kept offsite, to be restored in the event of damage or loss. **Drawbacks of structuring the bus company data** • The structured data, stored in a relational database, means the bus company will be required to maintain it.		**12**

	• The bus company will need to employ qualified administrators to maintain the database and its structure. • The bus company will be responsible for backing up the database and ensuring it is restored in the event of damage or loss. • The bus company will need to train personnel in using the database as part of their roles. • If the bus company wants to store qualitative data (in a relational database), it will need to be codified first. That needs experts and time. **The value of the extracted information** • The structured data, if it sufficient, can be used to spot trends in the data, such as an increase/decrease in popularity of routes so they can adjust the number/frequency of buses. • The data can be queried to identify increase/decrease in the reliability of buses, so they can decrease service intervals or consider replacements. • The data can be used to reconstruct a snapshot of the company, its finances, its personnel, and its buses at any given time. This would be useful in the event of legal or governance issues.		

Example:

<u>Data collected and stored</u>

- Personal information of customers will be required.
- Employees information will also have to be collected.
- Collection of data is a long process; time consuming.

- Customers may not be willing to provide personal information; privacy issues.
- Employees have legal concerns regarding collection of data; data could be sold, exploited.
- Storing data into the database can take time.
- A specialist may have to be hired, increasing costs.

Benefits of structuring data

- Easy to organise.
- Fits into fixed fields.
- Does not require language processing.
- Easy to access.

Drawbacks of structuring data

- Data may not be available for all customers.
- Some data may take longer to collect.
- Concerns about hacking or data theft.
- Specialists may have to be hired for IT systems; increased cost for the company.

Value for the bus company

- Information extracted from data can help make changes to the operating of the company; customers feel more satisfied.
- Information can be monetised: selling of customer data, use of customer data for targeted advertising, pay-per-click advertising, which will satisfy owners.
- Information about employees can help the company make decisions on recruitment and benefits to be given to existing employees.
- New routes can be offered according to information about customer and employee addresses.
- Wider customer base means more profit for the company.
- IT system helps contribute to the environment, as less paper usage, although energy consumption can cause added CO2.

Level	Mark		Descriptor
	0		No rewardable material.
Level 1	1–4		• Demonstrates limited knowledge and understanding, some of which may be inaccurate. • Applies understanding with limited coherence to produce a response that lacks development. • Demonstrates limited awareness of competing arguments. Conclusion, if present, is generic or unsupported.
Level 2	5–8		• Demonstrates knowledge and understanding, which is mostly relevant and may include some inaccuracies. • Applies understanding to make some coherent connections and a partially developed response. • Demonstrates some awareness of competing arguments, but this may be unbalanced, and partially supports conclusion with evidence.
Level 3	9–12		• Demonstrates accurate and relevant knowledge and understanding throughout. • Applies understanding coherently to produce a fully developed response. • Demonstrates an awareness of competing arguments and supports conclusion with evidence.

Total for question 6 = 14 marks

Total for paper = 80 marks

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