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MARKSCHEME

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INFORMATION TECHNOLOGY IN A GLOBAL SOCIETY

Standard Level

Paper 2

21 pages

Examiners should be aware that in some cases, candidates may take a different approach, which if appropriate should be rewarded. If in doubt, check with your Team Leader.

In the case of an "identify" question read all answers and mark positively up to the maximum marks. Disregard incorrect answers. In the case of a "describe" question, which asks for a certain number of facts *e.g.* "describe two kinds", mark the **first two** correct answers. This could include two descriptions, one description and one identification, or two identifications. In the case of an "explain" question, which asks for a specified number of explanations *e.g.* "explain two reasons", mark the **first two** correct answers. This could include two full explanations, one explanation, one partial explanation, *etc*.

"ITGS terminology refers to both the IT technical terminology and to the terminology related to social and ethical impacts."

SECTION A

Area of impact: Business and employment

1.   (a)   (i)   **Identify the key field in the RECEIVER_OF_LOAN table.**   *[1 mark]*

Business_ID.

Award [1 mark] for the correct answer.

(ii)   **Identify the data type for the field Phone_Number in the RECEIVER_OF_LOAN table.**   *[1 mark]*

text/alphanumeric/string

Award [1 mark] for the correct answer.

N.B. *"Number" is **not** appropriate as this data type would not accommodate numbers beginning with "0".*

Do not accept: letters or word

(b)   **The database administrator wishes to produce an alphabetical list of lenders from France who have contributed at least US$50 after 01/01/2001.**

Describe the query that produces the list specified above.   *[4 marks]*

- Amount_Loaned>=50
- Date_Loaned>01/01/2001
- Country=France
- Sort/display alphabetically by Family_Name.

Award [1 mark] for each of the above statements up to a maximum of [4 marks].

(c) **The field Business_Description should not be included in the LOANS table because this would lead to data redundancy.**

Explain why this could lead to inaccuracies in the database. *[4 marks]*

Answers may include:
- at data entry, if Business_Description is included in both the RECEIVER_OF_LOAN and the LOANS table, then a typing error will result in two different versions of the same data
- during editing (*i.e.* Business_Description is updated) a failure to update entries in both tables will result in two different versions of the same data
- different versions of data will lead to different output depending on whether a query includes the Business_Description field from the RECEIVER_OF_LOAN or the LOANS table.

[1 mark]
A limited response that indicates very little understanding of the topic.

[2–3 marks]
A reasonable description of reasons for not including the field in the LOANS table although the answer may lack appropriate reasoning at the lower end of the band.

[4 marks]
A clear, detailed and balanced explanation of the reasons for not including the field in the LOANS table.

(d)   **"*Kiva* provides a data-rich, transparent lending platform. We are constantly working to make the system more transparent to show how money flows throughout the entire cycle, and what effect it has on the people and institutions that lend, manage and borrow it along the way."**

Discuss what online services the *Kiva* web site could provide for effective online reporting back to the lenders about the status of the recipient's business and the loan repayments.   *[10 marks]*

Answers may include:
- e-mail alerts – send e-mail alerts to lenders each time a loan repayment is made informing them of the repayment amount/amount still owing
- cell (mobile) phone alerts
- web site with a secure web page for each lender – *e.g.* the web page may include descriptions of outstanding loans and the status of the repayment
- web site with a secure page for each business – this could include details of all loans, lenders and payments and videos/images of the business
- web site with graphic information – maps, interactive charts, graphs showing information about lenders and statistics of loans embedded Google map locating the business, track bar showing loan status
- widget to add to a web page/wiki – providing feedback on a lender's businesses/as a language translator
- blog – providing regular updates on status of loans
- forums – questions and answers about loans may be posted
- chat – lenders could chat with a *Kiva* representative about loans
- RSS feeds – lenders could subscribe to RSS feeds *e.g.* to hear podcast updates on a business
- the site could enable subscription to newsletters which are sent automatically to lenders
- searchable database – *Kiva* posts updates to the database which can be viewed from a web page.
- online rating system on the KIVA website to show status of the recipient's business.

Concerns for discussion
- download speed may be a limiting factor when accessing some of these services
- security is important to protect lenders' privacy regarding their loans
- some services require the user to download additional software which may have implications for security, disk space.

In part (d) of this question it is expected there will be a balance in the ITGS terminology between IT technical terminology and the terminology related to social and ethical impacts.

Please see generic markband information sheet on page 21.

SECTION B

Area of impact: Education

2. **(a)** **Identify** *two* **file formats that can be used for podcasts or vidcasts on PDAs.** *[2 marks]*

Answers may include:
- MP3
- ACC
- AIFF
- WAV
- M4A
- M4P
- H.264
- MP4
- AVI
- WMA
- MOV
- FLA/FLAC
- QTFF/Quicktime file format.
- WMV
- MPEG

Award [1 mark] for identifying each file format up to a maximum of [2 marks].

(b) **Describe the steps for producing a podcast file.** *[4 marks]*

Answers may include:
- set up the recording device (*i.e.* internal or external microphone)
- open the software to create a new podcast
- click on the record button and make a voice track
- edit the voice track
- add music and other effects as required (*e.g.* photos, sound effects)
- render the podcast
- save the voice track as a podcast file (e.g. M4A file format) / save as a compressed audio file.

Award [1 mark] for describing each step up to a maximum of [4 marks].

(c) **Explain** *two* **possible educational uses for podcasts or vidcasts other than providing access to lecture material.** *[4 marks]*

Answers may include:
- language teachers can create learning tutorials using podcasts so that the students can practice their lessons outside of class
- science teachers can create a vidcast to demonstrate a process (*e.g.* how to use a microscope) so that students can view the process whenever they have difficulties

- English students can record podcasts reading poems that they have written so that they can share both the poems and the audio versions on a web page for worldwide access
- a school director can make a podcast for a school web site to explain the new financial policy because a podcast adds a more personal touch to the accompanying statement
- book publishers can create podcasts so that blind students can listen to books.

Do not accept the university advertising their program.

Award [1 mark] for reasonable description of two possible educational uses for podcasts or vidcasts other than providing access to lecture material up to a maximum of [2 marks]. Award an additional [1 mark] for the explanation of each reasonable description of two possible educational uses for podcasts or vidcasts other than providing access to lecture material up to a maximum of [2 marks]. Mark the first two possible causes identified.

(d) **Many universities around the world are also making their lectures publicly available through online podcast and vidcast hosting services. The lectures cover a wide range of topics, opening up new opportunities for lecturing and learning.**

To what extent could stakeholders, other than students enrolled in the university courses, be affected by the public availability of university lectures as podcasts and vidcasts?   *[10 marks]*

Answers may include:
Benefits
- lecturers in other universities can view the online material and determine the nature of the teaching in other institutions
- students in other locations can view material in courses similar to ones that they are taking and get a broader perspective
- students who cannot afford to attend university can still access university lecture material
- lecturers can include more varied kinds of material in podcasts and vidcasts and this can be edited and updated
- persons can follow courses in subjects that they may normally not have access to
- the university may receive recognition for its outstanding lectures
- governments that financially support universities may see the improved education of citizens as a benefit.

Concerns
- lecturers at the university may be concerned that their lecture material is being used in other institutions and that they are not receiving recognition
- students in some parts of the world may experience difficulties in downloading podcasts and vidcasts due to technical problems
- publishers may be concerned that not as many of their published materials will be sold
- universities may lose fees, particularly for part-time or non-qualification courses, because potential students can access course material for free and do not enrol in the courses
- university professors may be disappointed/less motivated due to a reduced number of students attending their lectures since the podcast/vidcasts are publically available
- universities may have to upgrade their infrastructure due to the popularity of their podcasts and the increased number of persons accessing their servers.

Potential students are not students enrolled in the university courses and can be considered stakeholders.

In part (d) of this question it is acceptable if there is more emphasis on the terminology related to social and ethical impacts and less on IT technical terminology.

Please see generic markband information sheet on page 21.

Area of impact: Arts, entertainment and leisure

3. (a) **Identify *two* reasons why a social networking web site such as *Facebook* would provide access to free online social games through its web site.** *[2 marks]*

Answers may include:
- increase popularity over competitive web sites
- get a large number of users to join *Facebook* in order to play the game
- get members to stay on/return to the *Facebook* website
- increase number of advertisers due to high volume of traffic on the web site
- increase the chances of selling *Facebook* to another company
- expand membership so that personal data has value to third parties
- to make money from playing the game
- targeting online advertisements to the player's interests.

Award [1 mark] for each reason identified up to a maximum of [2 marks].

(b) *Pet Society* **downloads cookies on to your computer. Describe *two* possible ways that games companies could use cookies.** *[4 marks]*

Answers may include:
- for authenticating (*i.e.* remembers user names, for quicker login)
- collect and store IP addresses to identify location
- session tracking (i.e. track use of certain features to help improve them)
- remembering specific information about users, such as web site preferences/ play patterns to determine popularity of features length of play and anti-tampering checks
- store "save game" and "game settings" information to provide a better games service in which activities and achievements are remembered in the game.
- target ads to individual users who play their games

Do not award marks for collecting data from users accessing websites other than Facebook.

Award [1 mark] for identifying each way the social games company can use cookies up to a maximum of [2 marks]. Award an additional [1 mark] for the relevant description of each way the social games company can use cookies up to a maximum of [2 marks].

(c) **Online social games sometimes run slowly on home computers. Explain the factors that can cause this problem.** *[4 marks]*

Answers may include:
- computer may be performing other operations (running/loading)
- clock speed of processor
- amount of RAM
- speed of the graphics card
- low bandwidth
- number of persons across the world playing the game simultaneously
- number of persons in the home sharing the Internet connection.

[1 mark]
A limited response that indicates very little understanding of the topic.

[2–3 marks]
A reasonable description of the factors that can cause online social games to sometimes run slowly on home computers, although the answer may lack appropriate reasoning at the lower end of the band.

[4 marks]
A clear, detailed explanation of the factors that can cause social games to sometimes run slowly on home computers with reasoning. For this band, there must be two reasons (minimum) mentioned.

(d) **To what extent could the intensive playing of online games have long-lasting effects on the user?** *[10 marks]*

Answers may include:
Positive effects
- development of thinking skills (*e.g.* problem-solving skills, analytical and estimation skills and quick decision-making)
- use as therapy for some psychological problems (*e.g.* child develops a sense of participation, a sense of achievement, builds self-confidence)
- improvement in hand-eye coordination
- some online games foster teamwork and cooperation.

Negative effects
- excessive playing having health effects (*e.g.* carpal tunnel syndrome, fatigue, eye-sight problems, back pain)
- decreasing contact with real persons (*e.g.* family and friends) and increased interaction with virtual acquaintances
- most communication is through digital input; reduction in social skills
- Internet addiction
- psychological problems (*e.g.* loss of contact with the real world; the virtual world seems real)
- desire to replicate events from games in the real world (*e.g.* examples of online criminal events being replicated in real life).

Do not accept "obesity".

In part (d) of this question it is acceptable if there is more emphasis on the terminology related to social and ethical impacts and less on IT technical terminology.

Please see generic markband information sheet on page 21.

Area of impact: Health

4. **(a)** **Define the term** *pixel*. *[2 marks]*

Answers may include:
- picture element
- smallest component of a digital image
- arranged in a 2-dimensional grid
- a unit of measurement (e.g. 2400 pixels per inch)
- number of pixels per inch determines the resolution of a digital image.
- a dot with color

Award [1 mark] for any point up to a maximum of [2 marks].

(b) **Describe** *two* **steps that would need to be taken for a patient's** *2020 Vision* **images to be made available in** *MedSystems***'s medical records.** *[4 marks]*

Answers may include:
- link between the two systems to allow the transfer of the images
- images need to be exported from the *2020 Vision* system in a format compatible with *MedSystems*'s medical records, or alternatively the images in the *2020 Vision* system need to be exported and then converted to a file format (*e.g.* JPG, TIFF) compatible with the *MedSystems*'s medical records
- patients must agree that their images can be transferred (*i.e.* signed agreement)
- images need to be imported into the *MedSystems*'s medical records (*i.e.* FTP server, hard drive)
- the import of the images needs to be compared between the two systems to ensure that the import-export of the images worked correctly (*i.e.* resolution, colour, size and other important features have been maintained)
- accounts must be created in MedSystem's medical records to receive images
- images on FTP server /hard drive are transferred to the MedSystem's medical records.

Award [1 mark] for identifying each step up to a maximum of [2 marks]. Award an additional [1 mark] for the relevant description of each step up to a maximum of [2 marks].

(c) **Explain why images of the retina need to be converted to JPG format before being displayed on the *2020 Vision* web site.** *[4 marks]*

Answers may include:
- JPG "Joint Photographic Expert Group" (JPEG) format was specifically designed for the storing of photographic images; other formats may not be as well suited to photographic images
- JPG files achieve a smaller file size by compressing the image that retains detail (which matters most in the case of the retina)
- JPG files are smaller and requires less space on the server
- Images displayed in JPG format are visible through all internet browsers
- JPG is a compressed file format allowing for faster transmission speed.

[1 mark]
A limited response that indicates very little understanding of the topic.

[2–3 marks]
A reasonable description of why images of the retina need to be converted to JPG format before being displayed on the *2020 Vision* website, *although the answer may lack appropriate reasoning at the lower end of the band.*

[4 marks]
A clear, detailed explanation of why images of the retina need to be converted to a format such as JPG.

(d)   **The UK government has to decide whether to:**
- **continue to fund the current IT medical records system in an attempt to get it working**
- **abandon this development and outsource a similar records system to a third party such as *MedSystems*.**

Evaluate both of these strategies.   *[10 marks]*

Answers may include:
- privacy of the medical records (*i.e.* access by third parties, data mining)
- security (*i.e.* unauthorized access to medical records)
- reliability of medical information
- control of the medical records
- cost considerations for development
- expertise in developing medical records system
- ease of maintaining / upgrading the medical system
- political impacts (*i.e.* views of taxpayers)
- links to/consistency with other government databases.

Responses that address only one strategy can receive a maximum of 5 marks.

In part (d) of this question it is expected there will be a balance in the ITGS terminology between IT technical terminology and the terminology related to social and ethical impacts.

Please see generic markband information sheet on page 21.

Area of impact: Science and the environment

5.   **(a)   Identify *two* methods of updating a database with data from a spreadsheet.**   *[2 marks]*

- import wizard
- link the database and spreadsheet – updates are automatic / use a macro to automatically update
- copy and paste.

Award [1 mark] for each method up to a maximum of [2 marks].

(b)   A spreadsheet will be unreliable if data has been entered incorrectly.

Describe *two* ways to prevent the input of invalid data.   *[4 marks]*

Answers may include:
- set validation checks on cells – this can restrict the type of data that can be entered / prevent data being entered if it is outside a certain range
- cells can be locked – this prevents users changing cells that must not be changed / passwords only allow privileged users to make changes
- data entry can be limited to predefined values using a drop-down list of valid entries.

Award [1 mark] for identifying each way up to a maximum of [2 marks]. Award an additional [1 mark] for the description of each way up to a maximum of an additional [2 marks].

(c) **The output from the spreadsheet (Diagram 2) contains valuable data for users of the web site. Compare _two_ different ways a user may choose to save copies of this data to a personal computer (PC).** *[4 marks]*

Answers may include:
- the data can be downloaded as an XLS file – this allows the user to perform calculations in a spreadsheet
- the data can be downloaded as a data file/CSV file/comma-delimited format/ comma-separated values – this allows data to easily be shared between applications (columns are separated by a comma and rows begin on a new line)
- the data can be saved as a PDF – this allows the user to read/store/print the data but the user cannot operate on the numbers
- a screen shot could be taken and saved to disk – this allows the user to read/store/print the data but the user cannot operate on the numbers, it may be difficult to read
- the data can be copied and pasted into a spreadsheet – this gives the user access to the numerical data and the ability to perform calculations.
- the data can be saved in HTML format (File => save as) – this does not allow manipulation of the data

[1–2 marks]
A limited description that shows some understanding of the two ways a user may choose to save copies of this data to a personal computer. The two ways are described in isolation.

[3–4 marks]
An explicit and direct comparison of the two ways a user may choose to save copies of this data to a personal computer.

(d) **Many companies create their own spreadsheets so they can use the data from the government bureau of meteorology web site in order to assist in their decision-making. Results are often limited due to poor design, maintenance or control of these spreadsheets.**

Discuss the policies that a company can implement to overcome such problems. *[10 marks]*

Answers may include:
- testing – all formulae should be tested – values can be set to zero and all formulae should output zero / the trace function in Excel shows relationships between cells and formulae / manual checking of output with varying input values
- design should take into account ease of use – minimum inputs, clear, consistent and attractive layout
- documentation must be provided – *e.g.* original design/modifications
- if a spreadsheet is shared a single copy should be located centrally and all updates made to this file – otherwise multiple versions of the same spreadsheet will result
- data should be protected from accidental deletion or alteration – individual cells can be locked to prevent data being deleted or changed
- data should only be available to authorized users – the spreadsheet can be password protected / files can be stored on secure servers
- the spreadsheet should be protected from viruses/malware – this can be achieved with regular virus scans/regular Windows updates to MS Office
- a backup routine must be implemented – daily, weekly, monthly backups / backup media stored off site
- consideration should be given to new software updates which may provide enhanced decision making features
- data from the government web site should be downloaded on a regular basis to ensure currency of information
- training needs to be provided for staff who are involved in designing, maintaining or controlling the spreadsheets.
- spreadsheet software must be robust/offer online help/include templates

In part (d) of this question it is expected there will be a balance in the ITGS terminology between IT technical terminology and the terminology related to social and ethical impacts.

Please see generic markband information sheet on page 21.

Area of impact: Politics and government

6. **(a)** **Identify *two* reasons why the UK government is encouraging people to pay their vehicle tax online.** *[2 marks]*

Answers may include:
- fast – make a tax payment in minutes
- convenient – available 24 hours a day, 7 days a week
- accurate – verification steps along the way (*i.e.* to check and review information before it is sent)
- easy to use – a step-by-step process to successfully complete the payment
- secure – the government should offer the highest levels of security
- government tax revenue collection costs are reduced
- saves time waiting in lines
- can be paid from anywhere in the world.

Award [1 mark] for any reason up to a maximum of [2 marks].

(b) **When paying the vehicle tax online, the URL of the vehicle tax web site uses the protocol HTTPS. Describe the difference between HTTP and HTTPS.** *[4 marks]*

Answers may include:
- different default ports: 80 for HTTP and 443 for HTTPS
- HTTPS works by transmitting normal HTTP interactions through an encrypted system; HTTP does not use an encrypted system
- HTTPS – the information cannot be accessed by any party other than the client and end server; HTTP – can be transmitted over other servers
- HTTPS uses two common types of encryption layers: Transport Layer Security (TLS) and Secure Sockets Layer (SSL), both of which encode the data records being exchanged; HTTP does not encode.

Award [1 mark] for identifying each difference between HTTP and HTTPS up to a maximum of [2 marks]. Award an additional [1 mark] for a relevant description of the difference between HTTP and HTTPS up to a maximum of [2 marks].

(c) **Explain how the UK vehicle tax database system could make use of private key/public key encryption in order to safeguard an owner's data.** *[4 marks]*

Answers may include:
- encryption is the transformation of data so that it cannot be read by anyone except the intended recipient
- a key is an item of data that determines the form of the encryption
- when data is being transmitted, it is encrypted using a public key that is known to anyone
- it cannot be decrypted with the public key, but only with a private key that only the recipient has so anyone else who intercepts the data will not be able to decrypt it.

[1 mark]
A limited response that indicates very little understanding of the topic.

[2–3 marks]
A reasonable description of how a database system could make use of private key/ public key encryption in order to safeguard an owner's data, although the answer may lack appropriate reasoning at the lower end of the band.

[4 marks]
A clear, detailed explanation of how a database system could make use of private key/public key encryption in order to safeguard an owner's data with reasons.

(d)   **The UK government has access to a range of other databases such as:**
- **vehicle registration database**
- **income tax database**
- **police records**
- **cell (mobile) phone records**
- **credit card records**
- **Internet service provider (ISP) records of web sites visited.**

Data matching techniques allow the government to collate information from numerous sources and build up a comprehensive picture of an individual. Civil liberty groups are concerned about the amount of information that governments hold, the amount of access they have to other databases and how they use it.

With reference to specific examples, to what extent are the concerns of the civil liberty groups justified?   *[10 marks]*

Answers may include:
Concerns are justified
- using information for a purpose other than for what it was collected
- removing human judgment by automating decisions affecting individuals
- assuming that people found through data matching are guilty; requires people to prove their innocence
- falsely identifying individuals due to errors in some government databases
- sharing the results from data matching between government agencies and others (*e.g.* police, future employers, insurance claim agencies).

Concerns are not justified
- identifying someone who has not claimed an entitlement
- correcting errors and inconsistencies in the databases (*e.g.* personal information, instances of under-paying or over-paying)
- preventing/detecting instances of fraud (*e.g.* conflicting claims)
- tracing people wanted by the government.

In part (d) of this question it is acceptable if there is more emphasis on the terminology related to social and ethical impacts and less on IT technical terminology.

Please see generic markband information sheet on page 21.

Markband for all extended response questions.

Opinion discuss, evaluate, justify, recommend and to what extent	**0**	*No knowledge or understanding of IT issues and concepts or use of ITGS terminology.*
	1–2 marks	*A brief and generalized response with very little knowledge and understanding of IT issues and concepts with very little use of ITGS terminology.*

	3–5 marks	*A response that may include opinions, conclusions and/or judgments that are no more than unsubstantiated statements.*
		The response will largely take the form of a description with a limited use of ITGS terminology and some knowledge and/or understanding of IT issues and/or concepts.
		If no reference is made to the information in the stimulus material, award up to [3 marks].
		  At the top end of this band the description is sustained.
		  At the lower end of the band a tendency towards fragmentary, common sense points with very little use of ITGS terminology.

	6–8 marks	*A response that demonstrates opinions, conclusions and/or judgments that have limited support.*
		The response is a competent analysis that uses ITGS terminology appropriately. If there is no reference to ITGS terminology the candidate cannot access this markband.
		There is evidence that the response is linked to the information in the stimulus material.
		  At the top end of the band the response is balanced, the response is explicitly linked to the information in the stimulus material and there may be an attempt to evaluate it in the form of largely unsubstantiated comments. There is also evidence of clear and coherent connections between the IT issues.
		  At the lower end of the band the response may lack depth, be unbalanced or tend to be descriptive. There may be also implicit links to the information in the stimulus.

	9–10 marks	*A detailed and balanced (at least one argument in favour and one against) response that demonstrates opinions, conclusions and/or judgments that are well supported and a clear understanding of the way IT facts and ideas are related.* *Thorough knowledge and understanding of IT issues and concepts.* *Appropriate use of ITGS terminology and application to specific situations throughout the response. **If there is no reference to ITGS terminology candidates cannot access this markband.*** *The response is explicitly linked to the information in the stimulus material.* *At the lower end of the band opinions, conclusions and/or judgment may be tentative.*

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