M11/3/ITGSX/HP2/ENG/TZ0/XX/M

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INFORMATION TECHNOLOGY IN A GLOBAL SOCIETY

Higher Level

Paper 2

16 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."

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."**

[Source: http://kiva.org/about, 25 September 2009]

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 16.

Area of impact: Arts, entertainment and leisure / Health

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

Answers may include:
- a device that detects changes in a physical stimulus / responds to a physical stimulus / measures a physical quantity
- a device that records a signal that can be measured / identification of a type of sensor, *e.g.* one that measures body temperature
- a device that can measure analogue data which is then converted into digital data for analysis by a computer
- it generates a signal as output / sends a signal to a computer

*Award **[1 mark]** for each of the above points up to a maximum of **[2 marks]**.*

(b) Describe the steps involved in the transmission of the user's heart rate data to the exercise watch and then to the *Garmin* web site. ***[4 marks]***

Answers may include:
- sensors on the chest strap detect the heartbeat
- data is read as analogue then converted to a digital signal
- a signal is transmitted by the chest strap to the watch
- the signal may be sent by radio pulse/Bluetooth
- the watch acts as a receiver
- data is stored in the watch's memory
- the heart rate is displayed on the watch face
- the user logs on to the web site using an ID and password
- upload takes place using a cable/USB/flash drive to the computer/or wirelessly syncs to the Garmin website
- [on the website] the user clicks a button/uses special Garmin software/drags data across to upload data on the Garmin upload page

*Award **[1 mark]** for each step in the process up to a maximum of **[4 marks]**.*

(c) Some users have seen unusual/unexpected information displayed on the watch.

Explain *two* possible causes of inaccuracies in the data. ***[4 marks]***

Answers may include:

- the watch has a limited amount of storage available – if data is not deleted all the new data may not be recorded/recording errors could occur
- the chest strap may not be correctly worn – the signal may not be transmitted correctly
- sampling frequency – less frequent sampling may result in less accurate results
- calibration – incorrect calibration could lead to errors as the base starting point would be wrong
- digitization error – errors may occur when the signal is converted to a digital form
- noise/interference – noise / magnetic fields may interfere with the reading
- malfunction of the sensor – data capture may be intermittent
- personal information is wrongly entered – this would lead to incorrect calculations of fitness.
- a dying battery – giving unexpected results due to a weak signal/could affect data stored in memory

*Award **[1 mark]** for possible cause of inaccuracy of data up to a maximum of **[2 marks]**. Award an additional **[1 mark]** for the explanation of each possible cause up to a maximum of **[2 marks]**. Mark the first two possible causes identified.*

(d) Exercise watches have become very popular for athletes and individuals who exercise regularly. Evaluate the feature of this technology for the user. ***[10 marks]***

Answers may include:

Positives

- allows the wearer to monitor and adjust exercise using watch feedback/web analysis during the training session – feedback is immediate
- exercise data can be stored, tracked and later analysed on the Web site
- some watches include GPS which allows the wearer to calculate distance and speed when running
- accuracy of calculations – measurements are exact and not subject to human error in measurement/calculation
- features such as the heart rate monitor give a better overview of the results of exercise
- feedback is immediate – so the program can be instantly adjusted
- fitness programs, *e.g.* goals can be set for the amount of calories to be burned – this could provide motivation for the exercise program
- safety features – safe zones can be determined once personal data (*e.g.* height, weight, age) is inputted
- using the inputted personal data (*e.g.* height, weight, age) performances can be measured against benchmarks – this provides feedback on the success of the exercise program.
- data resulting from the exercise can be shared with other users online

Negatives

- inaccurate readings
- approximations due to sampling frequencies
- limited memory could mean new data is not recorded
- privacy of personal data stored on the web site complacency or worry due to inaccuracies – possible inappropriate adjustment of exercise programs.

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 16.

Area of impact: Science and the environment

3. (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 16.

Area of impact: Education / Politics and government

4. (a) Identify *two* steps that must be taken in order for students to be able to log in to the school network shown in the diagram above. ***[2 marks]***

Answers may include:
- a student is assigned an account
- enter username and password [to log on to the school server]
- user name and password is checked against a database of network accounts
- students need to be located within range of the wireless network/hotspot / need to connect their laptop to the wireless network
- enter a password for the wireless network
- students with private laptops may need to configure the laptop to access the network.

*Award **[1 mark]** for each of the above points up to a maximum of **[2 marks]**.*

(b) Describe the role of the uninterruptible power supply (UPS) *and* the role of the firewall shown in the diagram above. ***[4 marks]***

Answers may include:

UPS
- it is battery powered and will keep a computer running for several minutes after a power failure
- allows data in RAM to be saved
- allows a safe shutdown routine to occur.
- it acts as a surge protector to prevent surge of electricity *e.g.* during a storm or power cut

Firewall
- prevents unauthorized access to or from a private network
- examines each message passing through and blocks those it deems a security risk
- is frequently used to prevent unauthorized Internet users from accessing a private network
- can create a list of trusted websites and/or list of websites to be blocked
- protects users from malware.

*Award **[1 mark]** for identifying the role of the UPS and the role of the firewall up to a maximum of **[2 marks]**. Award an additional **[1 mark]** for the description of each role up to a maximum of an additional **[2 marks]**.*

(c) Explain why a school may decide to spend their money on training *and* network infrastructure before purchasing more hardware and software. ***[4 marks]***

Answers may include:

Training

- teachers may not have sufficient skills to use the hardware and software in their teaching
- technical staff may not have sufficient technical skills to manage a larger network
- students may need extra classes/teaching in order to maximise the benefits of new and possibly different hardware/software
- the school may train staff in the new software/hardware so they are proficient when it arrives/so they can decide on their exact licensing needs.

Infrastructure

- without a suitable network infrastructure (cables/wireless access point) new computers can only be used as standalone and will not have access to shared files/Intranet/shared apps *etc*
- if applications are stored on network servers, new servers/server upgrades may be needed to accommodate extra software
- students may only have access to dial up Internet, therefore purchasing a broadband connection may be considered more beneficial than further computers
- they may wish to ensure the current network is totally reliable/secure/adequate (*e.g.* regarding storage/backup/firewall) before adding complications with more machines/remote access/wireless access.

[1 mark]

A limited response that indicates very little understanding of the topic.

[2–3 marks]

A reasonable description of reasons for this decision although the answer may lack appropriate balance and reasoning at the lower end of the band. Award ***[2 marks]*** *for a training and an infrastructure need identified or one described. Award* ***[3 marks]*** *for a training and an infrastructure need both described.*

[4 marks]

A clear, detailed and balanced explanation of the reasons for this decision.

(d) In certain schools, students are able to purchase their own laptops which can be brought into school and configured to access the school network. Evaluate the school's decision to allow this to happen. ***[10 marks]***

Answers may include:

Positive impacts

- increased access to IT in classes – enabling incorporation of IT in the curriculum
- increased access to the Internet – for information research/global collaboration
- increased flexible learning – laptops can be taken to each class
- laptops can be used outside the classroom – *e.g.* taken on field trips/excursions
- cost savings for the school – if parents purchase laptops there will be less need for computer labs/less cost for printed materials as many schools use e-books
- laptops are becoming more affordable and features are improving for lower end machines end machines
- cost saving to parents if children can use a private laptop they have at home
- students who use a private laptop can choose their own hardware and applications – they may prefer a more advanced computer and the school laptops may be entry level
- students will be more familiar with their private laptops/applications and this could lead to greater productivity/schools will need to do less training and therefore have more time for teaching the curriculum
- work is easily transported between home and school – no need to transport work on a USB
- students may be more responsible for their own laptops
- students can synchronise their iPhone with their own laptop – they may download apps for school use – this may not be possible with school computers.

Considerations

- schools may not have the network infrastructure (wireless access/cabling *etc.*) to support additional computers
- concerns about potential viruses being uploaded from student laptops
- students may download inappropriate material to their laptops at home – this could be shared/displayed at school
- there may not be sufficient technical support staff to assist students with technical problems – it will be harder to assist students with private laptops which may be configured differently/have different operating systems from the school network
- teachers may not be sufficiently IT literate to manage laptops in the classroom
- cost to parents for software purchase and hardware upgrades
- equality of access – not all students will be able to afford their own laptops
- some students will have more powerful laptops – this may give them an advantage in class
- responsibility for security of personal laptops at school – who is responsible if they are damaged or stolen?
- school may require students to install certain software (*e.g.* screen viewing software) – software may conflict with other programs on their laptop
- unauthorised access to personal data on a private laptop.

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 16.

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.*

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