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MARKSCHEME

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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 / Arts, entertainment and leisure

1. **(a)   Identify** *two* **characteristics of a PDA.**   *[2 marks]*

   Answers may include:
   - handheld/palmtop computer
   - used for personal data/personal use – stores schedules, appointments, addresses, phone numbers, contains calculator, alarm clock
   - used for sending and receiving messages
   - wireless
   - touch screen
   - activated by a stylus
   - uses handwriting recognition technology.

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

   (b)   Using information from both diagrams, identify the steps involved in processing a customer's order and payment.   *[4 marks]*

   Answers may include:
   - the table number or take-away is selected
   - food items/quantity are selected (from options on PDA screen)
   - order is sent wirelessly to the server/waiter presses ORDER button
   - order is sent wirelessly to the kitchen printer / order is printed out on a printer in the kitchen
   - prices for each meal are looked up in a database on the server
   - the total amount owing is calculated
   - the total amount owing is sent (wirelessly) back to the PDA
   - PDA prints the bill/cashier printer prints the bill
   - PDA processes customer's credit card payment.

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

(c) **The PDA shown above allows waiters to select from options on the screen. Other PDAs allow users to input "handwritten" text directly on the screen.**

Explain how handwriting recognition works on a PDA. *[4 marks]*

Answers may include:
- input is via a stylus or touch sensitive screen
- handwriting recognition software is used
- input is converted to text
- a spell check can allow the user to mark final corrections
- the user has to learn shapes that correspond to each letter / users learn the Graffiti "alphabet"
- each letter shape is interpreted as a unique pattern for that letter
- the letter pattern is matched against a database of patterns
- a neural network/fuzzy logic may be used to predict characters
- input is analysed and compared with its inbuilt dictionary
- prediction may be based on context, grammar, nearby words
- it works on degree of probability
- it may learn the user's handwriting and continually improve recognition rate.

[1–2 marks]
A limited description that shows some understanding of the way handwriting recognition works on a PDA.

[3–4 marks]
A clear, detailed description which includes an understanding of the processing that takes place during handwriting recognition on a PDA.

(d) **The management of *Maggie's Meals* restaurant is considering introducing the *Wireless Waitress* system.**

Evaluate the implications for both customers *and* restaurant staff.   *[10 marks]*

Answers may include:

Advantages for customers
- faster service
- orders are not easily lost/forgotten
- fewer errors in taking orders – resulting in correct meals being served
- bill is automated – less likely to be mistakes in the calculation of the total
- the bill will be printed and therefore legible and more easily verified
- customers can keep track of the total bill as they are ordering.

Disadvantages for customers
- the system is less personalized as the waiter is concentrating on the PDA
- the system is limited to precisely what is on the selection menu – customers may wish to order variations *e.g.* coffee with just a small amount of milk
- does an additional order (*e.g.* coffee after the meal) result in an additional bill? – this would be inconvenient for the customer
- can an order easily be changed or cancelled?

Advantages for staff
- orders can be taken efficiently – the user-friendly order interface provides simple data entry – this could result in more return business/increased profits – waiters may serve more tables (increased tips?) but this could mean fewer staff are needed (job loss)
- billing is automated – staff do not have to manually calculate bills
- kitchen staff have fast access to printouts – these are easier to read than handwriting
- the system keeps track of sales – past sales can be easily accessed and analysed
- faster to serve as staff do not need to walk to the kitchen.

Disadvantages for staff
- reliance on technology – computer failure would necessitate running a manual system
- staff need to be trained to use the system
- cost to management (staff) to purchase PDAs, set up wireless network, train staff – the cost could be passed on to customers through more expensive meals
- increased efficiency could mean fewer staff are needed to server resulting in some job loss.

*Award up to a maximum of **[7 marks]** for only evaluating implications to **either** customer **or** restaurant staff.*

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

Please see generic markband information.

Area of impact: Education

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

Answers may include:
- unsolicited e-mail
- e-mail sent in bulk to lists of recipients

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

Award [1 mark] for any one of the points below if a student has not already reached the maximum marks. (A student may not gain [2 marks] by only mentioning the points below as alone these do not define spam).

- e-mail that is often irrelevant and contains inappropriate material/often advertising products
- generally comes from an unknown source
- is automatically generated
- may contain a virus.

(b) **Many schools no longer print and post newsletters.**

Describe *two* **ways schools can distribute newsletters electronically to parents and the school community.** *[4 marks]*

Answers may include:
- via a listserv – subscribers join the listserv which automatically sends e-mails to all names on a mailing list
- via a web site/intranet – the newsletter file (in PDF format) is uploaded to the school's web site and parents can log in and download it
- via a web site – the newsletter is copied and pasted onto the web page
- via e-mail – parents' names are on a distribution list and the school secretary sends the newsletter by e-mail/parents subscribe or choose to opt in/sent as an attachment which can be downloaded and saved to parents' computer/sent as a pdf so it cannot be edited/can be accessed by laptop or PC or smartphone
- via a school portal/intranet using push technology
- via a blog – parents can subscribe to receive updates *e.g.* via RSS.

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 [2 marks].

(c)   **Many parents receive the SMS alerts on their smart phones. The latest smart phones come with up to 32 GB of storage.**

Explain the reasons why many people want this amount of storage on their smart phones.   *[4 marks]*

Answers may include:
- users can download and store "apps" – apps add functionality but require storage space
- the smart phone stores an operating system – if this is updated, the operating system requires additional memory
- storage for podcasts – these may be long and hence require large amounts of storage space
- movies and TV shows can be downloaded and stored – multimedia files are large
- storage of digital photos taken with the inbuilt camera – high resolution photos are large
- storage of music files – takes up a large space
- users often wish to store files so they can be shared with friends
- smart phones can be used as eReaders – therefore storage space is needed to store eBooks
- smart phones need storage space to store documents that can be edited with Docs to Go applications, or sent by email and need to be stored to work on them, read or share.

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

[2–3 marks]
A reasonable description of the reasons why smart phones need this amount of storage space, 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 why smart phones need this amount of storage space.

(d) **Discuss the advantages and disadvantages of introducing** *Simplified Alerts* **for schools** *and* **parents.** *[10 marks]*

Answers may include:

Advantages for schools
- a cheap way of contacting a large group of people
- fast/convenient – one message can be sent to all relevant school staff and parents
- easy to reach parents in cases of emergency
- easy to use – little staff training is required
- convenient as standard messages can be prewritten and stored
- allows the school to keep records of past messages.

Disadvantages for schools
- the school does not know if the message is received – who is responsible in an emergency if parents don't check their cell (mobile) phones or e-mail?
- if the system fails an alternative method must be put in place
- the system relies on up-to-date parental information / notification of alternative contact details if parents are away
- training costs
- cost of purchase and maintenance of the system
- if parents enter incorrect details/data entry error then messages will not be received
- there will be a time lag at the start whilst parents sign up and enter details.

Advantages for parents
- parents can be alerted to sports cancellations – saves time travelling to a cancelled practice
- it is a fast way of making contact in an emergency
- many parents have cell (mobile) phones/e-mail – no additional services are needed
- parents can be alerted anywhere they have their cell (mobile) phones
- more reliable than a note sent home after school – *e.g.* to inform of changed location of sport practice.

Disadvantages for parents
- if the system fails messages may not arrive/may arrive too late
- parents who do not have cell (mobile) phones or e-mails cannot participate – alternative methods would need to be used in this case as parents may feel excluded
- parents may not check e-mails regularly and therefore they will not receive the information or will receive it too late
- size limit on SMS messages means they will be cryptic and may not be fully understood
- overuse of the system could become annoying
- the school must ensure that personal details (name, email address, mobile phone number) are secure
- if parents are not in the country messages may have a high cost to send (some phone carriers may even charge parents when receiving them)

- alerts may arrive at inconvenient times and interrupt parents activities at work (*e.g.*: during an office meeting) and parents may switch it off or opt out if these become too frequent.

*Award up to a maximum of [7 marks] for only discussing implications to **either** schools **or** parents.*

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

Please see generic markband information.

Area of impact: Health

3.   (a)   **With reference to the relational database diagram above, describe the nature of the relationship between the table DRUGS and the table INTERACTIONS.**   *[2 marks]*

Answers may include:
- one to many
- one drug can have many different interactions
- one record in the DRUGS table may have many corresponding records in the INTERACTIONS table
- The field Drug_Name links the two tables.

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

(b)   **It is important that the database is accurate.**

Describe *two* design features that a database designer could use to prevent data input errors.   *[4 marks]*

Answers may include:
- setting field types – *e.g.* a field set to "numeric" only allows numbers to be entered / a field set to "date format" only allows dates to be entered
- using input masks – the number of characters and their type can be specified
- creating drop down lists – this limits the input to a set list
- adding validation rules – this allows a range check on the data
- creating user input forms – limits data input to information specified by the database designer.

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

N.B. *Do not accept access levels/passwords*

(c)   This prescription database now comes in many electronic formats. Two possible formats are a CD-ROM version and an online version accessible through a web site.

Compare the effectiveness of these two formats in providing a doctor with the necessary information.   *[4 marks]*

Answers may include:
- the CD may only be updated a couple of times a year – the online version can be updated as new drugs/conditions appear
- the information on the CD is limited – the online version can provide hyperlinks to further medical information/contacts
- multimedia files, *e.g.* for training, are readily accessible on a CD – access to multimedia will depend on bandwidth in the online version
- the CD runs on a local computer with no internet requirements – the online version requires internet connection
- if the internet connection is lost then the database is not accessible throughout the doctor's consultation with the patient – if a single computer breaks down another computer can be used to access the CD
- the online version could be slower than the CD if there is a slow internet connection – this might increase the time of the consultation
- CD content cannot be changed – the online version is susceptible to hacking
- CDs have limited storage (more than one CD may be needed) – more can be stored using an online version
- CDs can become damaged or lost – the online version is less susceptible to damage/lost data (provided it is secured/backed up).
- technical issues could arise when installing a CD
- online versions available on mobile devices and netbooks, CD-ROM is not accessible on these devices

[1–2 marks]
A limited description that shows some understanding of the effectiveness of a CD-ROM version and an online version. The two ways are described in isolation.

[3–4 marks]
*A direct **comparison** of the effectiveness of a CD-ROM version and an online version in providing the **doctor** with the necessary information.*

(d) **Discuss how the use of the prescription database shown above can help a doctor to improve medical care.** *[10 marks]*

Answers may include:
- a database contains comprehensive information – a textbook can be more limited due to size/updates and/or the doctor's own knowledge is limited
- search techniques/complex queries allow fast access to information – whereas doctors may take time consulting textbooks / doctors may have more time for other patients
- provided data is entered correctly, information will be accurate – textbooks become out of date quickly and may not include details of the latest drugs – and/or a doctor's memory may not be reliable
- information can be easily updated – a text book becomes out of date quickly and needs to be reprinted – and/or a busy doctor may not have time to keep up to date with the latest medical journals
- complex queries/reports can be generated and provide a more detailed explanation of drug effects – whereas manual searching is limited
- by alerting doctors to interactions with other drugs/conditions, serious side effects can be avoided – side effects could be flagged in a database – and/or doctors can't remember all interactions/side effects
- a database can include a user-friendly interface – books are sometimes difficult to navigate
- electronic formats enable printing of prescriptions and these could possibly be copied to a patient's electronic file
- results displayed on a screen will be easier to read (may be enlarged) – small print in textbooks can be difficult to read and may result in incorrect doses.

CONCERNS
- doctors cannot use the system and training may be required
- doctors cannot apply their findings to a particular patient
- the database is not up-to-date – new drugs/interactions are not included
- the design of the database is faulty/queries are not accurate.

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.

Area of impact: Politics and government / Science and the environment

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

Answers may include:
A sensor is a device:
- that detects/measures a physical quantity/detects changes in a physical stimulus/responds to a physical stimulus
- that converts the information into a signal/records a signal that can be measured
- for example (identification of a type of sensor *e.g.* heat sensor)
- that can measure analogue data which is then converted into digital data for analysis by a computer
- that generates a signal as output/sends a signal to a computer.

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

(b)   **Identify the steps involved in calculating the monthly non-recyclable waste cost for a household.**   *[4 marks]*

Answers may include:
- the RFID reader in the truck transmits a signal to the RFID tag
- the serial number is sent from tag to reader / the serial number on the tag is read by reader
- the serial number is sent to a computer database in the garbage truck/central computer
- the serial number is matched in the database to find the related household record/details
- the rubbish weight is calculated – the full bin is weighed and empty bin weight subtracted/the rubbish is tipped out of the bin and weighed
- the serial number and rubbish weight are recorded in the database / a record is generated – serial number, weight, date
- at the end of the day's rubbish collection the data is downloaded to the central computer
- cost is calculated by multiplying rubbish weight by fee/based on total weight
- totals/total costs/total garbage are summed for a monthly report/account

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

(c) **Local governments want to create an advertising campaign that targets neighbourhoods where householders have large quantities of non-recyclable garbage.**

Explain how data mining can be used to identify these neighbourhoods without breaching householders' privacy. *[4 marks]*

Answers may include:
- data mining involves search/analysis techniques aimed at finding hidden patterns and relationships in a set of data
- data mining can look for particular geographic areas where non-recyclable waste is very high
- since the serial numbers on the bins identify each household they should not be included
- these serial numbers/key fields can be replaced by numbers that identify the neighbourhood but not the household (if a serial number included suburb-street-house then only the first part of the number would be used in data mining).

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

[2–3 marks]
A reasonable description of how data mining works. At the lower end of the band there may be little reference to the scenario and safeguarding privacy.

[4 marks]
A clear, detailed and balanced explanation of how data mining can provide a solution whilst safeguarding privacy.

(d) **Many householders have expressed concerns about having their garbage monitored in this way.**

To what extent are these concerns justified? *[10 marks]*

Answers may include:
Concerns for householders
- a rubbish profile could be seen as an invasion of privacy – this problem can be minimized by implementing data security measures
- the government could add taxes/charges/fines for excess rubbish – however there could also be rebates for those who do not reach their rubbish limit/ should houses with more occupants be given larger rubbish allocations?
- if households have more rubbish than the permitted "free" amount there might be a temptation to engage in fly-tipping/sneaky dumping to save costs, thus leading to a degradation of the environment
- neighbours may dump rubbish in other people's bins to decrease their own bin weights – however, neighbourly disputes on bin ownership could be resolved
- likelihood of errors in weighing / incorrect matching of bin to households could lead to incorrect calculations and bills – validation checks on householders' likely rubbish volumes could be built into the software
- hackers could monitor changes in waste and determine if householders are away and properties are empty – this problem can be minimized by implementing data security measures
- function creep – governments could use the information for purposes other than intended, *e.g.* if the amount of waste increases they may investigate to see if unexpected people are living at that address
- householders should be provided with government policies on how the data is used.

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.

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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