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GRADE 12

INFORMATION TECHNOLOGY P2

FEBRUARY/MARCH 2014

MEMORANDUM

MARKS: 180

This memorandum consists of 19 pages.

SECTION A: MULTIPLE-CHOICE QUESTIONS**QUESTION 1**

- | | | |
|------|-----|-----|
| 1.1 | C ✓ | (1) |
| 1.2 | A ✓ | (1) |
| 1.3 | D ✓ | (1) |
| 1.4 | C ✓ | (1) |
| 1.5 | B ✓ | (1) |
| 1.6 | C ✓ | (1) |
| 1.7 | D ✓ | (1) |
| 1.8 | D ✓ | (1) |
| 1.9 | C ✓ | (1) |
| 1.10 | D ✓ | (1) |

TOTAL SECTION A: 10

SECTION B: HARDWARE AND SOFTWARE**QUESTION 2**

- 2.1 2.1.1 A *register* acts as temporary storage✓ to keep data and instructions to be executed by the CPU✓. (2)
- 2.1.2 Any *TWO reasons why instructions in cache are processed faster than instruction in memory* ✓✓:
- Cache is higher quality/faster type of memory/cache is static RAM compared to dynamic RAM
 - Cache is positioned on the CPU/Cache closer to CPU and thus fetches instructions faster
 - Data in RAM needs to be transferred via busses to the CPU before it can be processed/Fetching of instructions from cache is not restricted by slow speed of the motherboard
- Also accept any other correct reason* (2)
- 2.1.3 *Decode stage:*
- The instruction code is separated✓ from the address of the memory, i.e. where the data that is required has to be fetched/stored✓
- OR
- The instruction is broken up into two parts – the instruction code and the address
- Also accept any similar explanation* (2)
- 2.1.4 Any *ONE of* ✓:
- System bus
 - Internal bus
 - FSB (front-side-bus) (1)
- 2.1.5 (a) To plug in 3D graphics cards ✓ (1)
- (b) North bridge ✓ (1)
- (c) (i) The hardware is physically part of the motherboard ✓ (1)
- (ii) The computer has to be switched off and opened up to be able to plug in devices✓. (1)
- Also accept any other correct explanation.* (1)

- 2.1.6 (a) *Any TWO differences between RAM and ROM ✓✓:*
- ROM has smaller capacity than RAM
 - ROM takes physically less space than RAM
 - ROM slower than RAM/slower type of memory
 - ROM content stable even if computer is switched off – RAM loses its content (volatile)
 - ROM read only – RAM read and write access possible
 - ROM is mounted on motherboard – RAM is mounted on modules slotted into the motherboard
- (2)
- (b) *Purpose of ROM (Any ONE of ✓):*
- ROM contains instructions to be executed when the computer is switched on
 - The software controlling non-computerised devices such as microwave ovens, etc. is stored in ROM-chips

Also accept any correct alternative explanation (1)

2.2 2.2.1 SATA ✓ (1)

- 2.2.2
- *Latency* is the time during which the read/write head of the hard drive is idle while the platter spins to the correct sector. ✓
 - *Seek time* is the time taken by the read/write head to find the correct track ✓
- (2)

2.2.3 *Disk caching* is when part of the RAM ✓ is used to store parts of the application that must be saved on the hard drive ✓ so that faster access to the software is possible. (2)

- 2.2.4 (a) *Thrashing:*
- Occurs when the operating system spends so much time exchanging pages ✓ between the RAM and hard drive (virtual memory) ✓ that it seems there is no time to process any other task
- OR
- When the amount of virtual memory is too small for the amount of data that needs to be stored, it seems that the hard drive light keeps flashing, while the exchange of pages occur between the RAM and smaller amount of virtual memory

Also accept similar explanation. (2)

- (b) *Prevent thrashing (Any ONE of ✓):*
- Install more RAM
 - Close unused programs/documents to release more RAM
 - Allocate more hard drive space for virtual memory
- (1)

- 2.3 2.3.1 *Any THREE aspects compared ✓✓✓*
One mark for each correct comparison

	OSS	Freeware
<i>What is included?</i>	Source code of software is supplied.	Only executable program is made available.
<i>Means of distribution</i>	Free to download from Internet. Permission is granted to change, modify and redistribute the software	Anyone can make a copy and distribute the copy free of charge/may not resell the software
<i>Support</i>	Only if you buy the support On-line communities	None
<i>Availability of Upgrades</i>	Program is developed by community and anyone can contribute to program	Only available from developer if a new version is released

(3)

- 2.3.2 With shareware you have to buy a licence after a certain time (evaluation time)✓ whereas with freeware the software is free to use without any licence. ✓

Accept any similar explanation

(2)

- 2.4 2.4.1 *Any ONE smartphone operating system ✓*

- Symbian
- Android
- Windows 8 Phone
- Apple iPhone/iOS 6/iOS 7
- Blackberry OS

(1)

- 2.4.2 *Memory management: Any THREE facts ✓✓✓*

The operating system must ensure that:

- Each process in RAM has enough memory space
- No process tries to use memory space allocated to another process
- All the different types of memory in the computer are used efficiently
- Used memory is released when it is no longer in use
- All programs that are running are in RAM so that the CPU can fetch their instructions and execute them

(3)

- 2.4.3 *Any TWO reasons for missing content of website on smartphone✓✓:*
- Smartphones have much lower screen resolutions in comparison to a standard computer
 - Some websites don't make mobile-browser-specific versions of the website available
 - Depending on web page content it can take substantially longer to load a page on a mobile browser – and the images may seem to be missing
- (2)

- 2.5 2.5.1 Make use of a UPS to supply power to the PC✓ for a limited time period so that the user can save/backup data being used and safely shut down✓.
- (2)

- 2.5.2 *Any TWO reasons for data loss and the correct measure(s) of prevention: ✓✓✓✓*
(1 mark - reason for loss/damage, 1 mark for prevention)
- damaged equipment/computer crash – maintain computer equipment; keep computer free from dust
 - hacking/cracking – install firewalls
 - theft – protect data via passwords and restricted access
 - deletion of data by user - protect data via passwords and restricted access/set user rights to prevent editing documents
 - deletion of data by viruses – have up to date anti-virus software

Also accept other correct alternative answers (4)

- 2.5.3 *Any TWO reasons why local hard drive not suitable for backup✓✓:*
- Difficult to remove and keep in a safe place somewhere else.
 - Space can be a problem for backup of large volumes of data
 - Many copies on different local hard drives can become a problem to manage
 - Local hard drive may be susceptible to virus attacks – destroying the files
 - Computer crash – can cause read/write heads to damage hard drive platters while spinning

Also accept any other valid explanations (2)

- 2.6 2.6.1 *Any THREE advantages of local network from organisers viewpoint: ✓✓✓*
- Centralisation of data
 - Sharing of hardware – reduce operating cost
 - Improved security
 - More efficient use of resources
- Also accept any other valid explanation* (3)
- 2.6.2 Star✓ (1)
- 2.6.3 A switch is used for a specific type of network✓ while a router is able to join and convert data packets from one type of network to another. ✓ (2)
- 2.7 2.7.1 Internet browsers✓ (1)
- 2.7.2 *Any TWO useful protections from anti-virus software: ✓✓*
- Scanning of e-mail
 - Prevent malware/backdoor software
 - Prevent adware/spyware
 - If file is infected by a virus – quarantine/sandbox mode the file
- NOTE:** Do not accept protection against virus
Also accept any correct alternative answers (2)
- TOTAL SECTION B: 50**

SECTION C: APPLICATIONS AND IMPLICATIONS**QUESTION 3: e-COMMUNICATION**

- 3.1 3.1.1 A *cookie* is a small text file that is automatically saved to your computer by a website✓ and contains information on your web activity✓. (2)
- 3.1.2 *How and why cookies can be misused:*
Websites can be programmed to read the cookies on your computer✓ and analyse and establish your preferences in terms of websites. Due to this activity you can be targeted with spam. ✓ (2)
- 3.2 3.2.1 *Spam* is bulk distributed e-mails that usually advertise something that you don't want or need. ✓ (1)
- Also accept any other correct explanation* (1)
- 3.2.2 *Prevent computer from sending spam: Any ONE of ✓:*
- Make use of anti-spam software/content filtering software
 - Regularly scan your computer for any malicious software with anti-spyware software
 - Scan and remove the virus sending spam using an anti-virus program.
 - Do not accept invitations from unknown Internet sources asking for account details as this may hijack your e-mail account for sending out spam.
- Also accept correct alternative explanations* (1)
- 3.2.3 *Any TWO ways to limit the receipt of spam ✓✓:*
- Contact your ISP/network administrator and ask them to put filters on the e-mail you receive
 - Do not supply your e-mail address to anybody
 - Install spam filters/content filtering software
- Also accept any other applicable suggestion* (2)
- 3.3 3.3.1 *Encryption* is a method where text or data is scrambled✓ to an unreadable format.✓ (2)
- 3.3.2 (a) Public Key Encryption✓ (1)
- (b) *Digital certificate* is a certificate that verifies✓ the authenticity of a company/person✓. (2)
- (c) *Any ONE of ✓*
- Thawte
 - VeriSign
- Also accept any other correct alternative* (1)

[14]

QUESTION 4: SOCIAL AND ETHICAL ISSUES

- 4.1 4.1.1 E-commerce ✓ (1)
- 4.1.2 *Any TWO advantages for selling products over Internet: ✓✓*
- No need to have the expenses of opening and maintaining a shop
 - No need to have a lot of stock/no need to rent warehouses to house all the stock
 - Catalogue is available 24/7.
 - A new catalogue can be created and uploaded without the need to print and distribute the new catalogues
 - Orders can be placed 24/7
- Also accept any other correct alternative* (2)
- 4.1.3 *DoS-attack* is when the website of the company is flooded with service requests so that it becomes overloaded and is either slowed down or crashes completely. ✓
- Negative influence on business (Any ONE reason): ✓*
- Website becomes very slow and cannot accommodate online traffic
 - Website crashes and is unavailable – no transactions can take place/no goods can be sold or advertised
- (2)
- 4.2 4.2.1 *Any ONE reason why different results is obtained: ✓*
- Different search engines index results differently
 - Different search engines put different values on web pages depending on the number of hits/searches a website/phrase it receives
- Also accept any other correct alternative* (1)
- 4.2.2 *Any ONE recommendation to improve search results of: ✓*
- Use more appropriate keywords to indicate what he was looking for
 - Add more keywords to get more precise results
- Also accept any other correct alternative* (1)

- 4.3 4.3.1 *Any TWO ways of becoming more environmentally friendly: ✓✓*
- Make sure computers are switched off or reduce power usage/put computers in hibernation/lower power state
 - Buy and use energy saving computer components
 - Recycle paper that was printed on/try to run a paperless office
 - Use flat screen monitors

Also accept any other correct alternative (2)

- 4.3.2 *Any ONE suitable/ethical way of disposing of outdated computers:*
- Take it to an e-recycling plant
 - Dismantle old computers and use different parts for training/educational purposes

Also accept any viable alternative

NOTE: Do not accept donating it to a charitable organisation (1)

[10]

TOTAL SECTION C: 24

SECTION D: PROGRAMMING AND SOFTWARE DEVELOPMENT**QUESTION 5: ALGORITHMS AND PLANNING**

5.1 5.1.1 AthleteNumber ✓ (1)

5.1.2 *Any TWO FIELDS ✓✓:*
(Mark allocation: 1 mark for database field AND correct data type)

- PhoneNumber – Text
- DateOfBirth – Date/Time
- Result - Number

(2)

5.1.3 *Any ONE of ensuring format of date of birth: ✓*

- Use an Input Mask on the date field inside the database
- Make use of data validation in the application software
- Make use of appropriate input components/control structures in the application software

(1)

5.1.4 *Any ONE of preventing field left blank ✓*

- Set the 'required' property of this field to YES
- Set the 'allow zero length' property of this field to NO
- Set a *validation rule* for this property that doesn't allow empty or zero length names
- Use the field, *AthleteName* as part of a combined primary key
- Make use of defensive programming techniques in the software/program making use of the database

(1)

5.1.5 (a) The *AthleteNumber* number is unique✓ which implies that a duplicate record for the athlete cannot be created to enter another event✓. (2)

(b) Normalise the database to at least 2NF✓ by creating separate tables for the athletes and the events✓. Link the two tables using athlete number✓ in a one-to-many relationship.

OR

Alternative solution:

Normalise the database to 3NF, creating three tables: an athletes table (*AthleteID* as primary key); an events table (*EventID* as primary key) and a events participation table (using a compound primary key: *AthleteID* and *EventID*). All three tables are linked to one another in two one-to-many relationships.

NOTE: Do not accept:

- Add extra fields to the table to accommodate the six events and their results.
- Restrict the athletes to only one item per event

Also accept any valid alternative description (3)

- 5.2 5.2.1 *Any TWO features of good documentation ✓✓:*
- Provides a thorough walkthrough of the program
 - Provides a troubleshooting section
 - Is written in a non-technical way
 - Is easy for any level of user to understand

NOTE: Do not accept page/font formatting. (2)

- 5.2.2 (a) *Any TWO reasons for including comments in code ✓✓:*
- For programmers to understand what the code does/remind the programmer about the function of a piece of code
 - Easier to find specific code for debugging purposes
 - To identify the programmer/to add copyright information to the section of code

Also accept any other correct alternative (2)

- (b) *Any TWO topics that need to be included in technical documentation ✓✓:*
- Class diagrams.
 - Entity relationship diagram.
 - Thorough explanation of code.
 - Descriptions of specialised or unusual code.
 - Technical requirements of the computer system.

Also accept any other correct alternative (2)

- 5.3 5.3.1 *Defensive programming* is programming to avoid errors that will prevent the normal execution of the program.✓

Accept any similar explanation (1)

- 5.3.2 (a) *Any ONE reason for overflow errors to occur ✓:*
- It is an error that occurs when a value to be stored in a variable is outside the range of the data type/is too large
 - The data type restricts the size of the value to be saved in the variable.
 - It happens when the maximum allowable value for that data type is reached and if incrementing the value will cause the lowest negative value to be assigned to the variable, e.g. saving 258 in 8 bits will be saved as 2.

Also accept any other correct answer (1)

(b) *Any TWO programming techniques to prevent runtime error✓✓:*

- Validation of input
- Use control structures to test range of input (only execute if conditions are met)
- Use exception handling techniques such as try...except/try...catch to handle conversion errors

Also accept any other similar correct explanation (2)

5.4 5.4.1 *Context sensitive help* – these are tool tips that popup to display information about the current component on the interface that the user is interacting with✓. (1)

5.4.2 *Any TWO aspects critically commented on ✓✓:*

Examples:

- No indication whether the input has to do with athletes – include in header "Enter athlete's information"
- DOB – no explanation, rather write out the abbreviation/ No indication of the format of the date to be entered
- Address field too small/Address field should be larger/No indication if address refers to physical or postal address
- No indication of the format of the gender (F or M or Female or Male)

NOTE: Do not accept any reference to context sensitive help

Also accept any other correct answer (2)

5.4.3 *Any TWO ways of improving valid data entry ✓✓:*

- The DOB field can test for a valid date to be entered before submitting/Using calendar/text or edit-boxes for entering the day; month and year of date of birth with validation
- Indicate if physical or postal address is required and allow for extra inputs with validation on postal code
- The Gender field can be a drop down list/radio group with options for male/female

NOTE: Do not accept any reference to context sensitive help

Also accept any other relevant explanations (2)

5.5 5.5.1 Creating an *algorithm* helps to define a solution ✓ so that code can be implemented in an efficient and organised way✓.

Also accept any other correct explanation (2)

5.5.2

Line	Explanation
4 ✓	An additional test condition is required – need to test for the size of the array with (counter < array size) ✓
7 ✓	The increase of the counter should not be part of the IF-statement ✓
8 ✓	<i>Any ONE of:</i> ✓ <ul style="list-style-type: none"> Setting the flag to false must be removed – because the current loop will then be an infinite loop with the correction to line 4 the loop will terminate when the size of the array is reached and found will have the value of false

(6)

5.5.3

(a) *Any ONE of:* ✓

- The program is case sensitive (upper and lower case letters)
- The user made a spelling mistake when entering the name of the athlete e.g. adding a space after the name

NOTE: Do not accept any indication of logical errors

(1)

(b) *Any ONE reason why defensive programming will not be able to prevent the incorrect spelling of names* ✓:

- the data entered will be valid but not correct
- defensive programming is able to validate numerical data ranges and not spelling of strings, unless comprehensive use of dictionaries is used for validation

Also accept any correct alternative explanation

(1)

5.6

5.6.1

Any ONE suitable data structure for collection of athletes ✓:

- Array/List/Vector
- Text file/binary file/file of records/XML-data files
- Recordset based on a database table

(1)

5.6.2

Any ONE of class violates data encapsulation: ✓

- Data encapsulation* requires data fields/attributes of a class to be private attributes
- The gender and club attributes are declared as public (+ sign) and not as private

NOTE: Do not accept: *mention of private methods (**getName** and **getAddress**) - a class may contain private methods which are accessible from inside the class implementation and as such doesn't violate the data encapsulation principle.*

(1)

5.6.3

The **setAddress**-method provides the opportunity to change the content of the address attribute of an instantiated object ✓ for instance when the athlete is changing his/her residential/postal address – the value needs to be updated.

(1)

- 5.6.4 (a) *Explain why overloading of constructors is required ✓✓*
- An object may need to be instantiated with or without values depending on if the values of the attributes are known at the time of instantiation.
 - When setting up an athletics meeting the names of all the athletes going to participate are not always known and therefore it may require that a “blank/empty” athlete is created to allocate memory for the object – with registration these data can be changed using mutator methods

Also accept any correct alternative explanation (2)

- (b) Yes ✓ (1)

- 5.6.5 *Any ONE reason for error. ✓✓*
- The list of parameters differs from the method declaration
 - There is no overloaded version of this method with different sets of parameters.
- (2)

5.7 5.7.1 Array of Strings✓ (1)

5.7.2 Array of objects✓ (1)

5.7.3 String✓ (1)

- 5.7.4 *Any ONE of ✓:*
- 2D array
 - Array of objects
- (1)

TOTAL SECTION D: 47

SECTION E: INTEGRATED SCENARIO**QUESTION 6:**

- 6.1 6.1.1 3G: Third generation.✓ (1)
- 6.1.2 *Any TWO problems with 3G ✓✓:*
- Not always available due to weather conditions, etc.
 - Eavesdropping can take place to get hold of results
 - There may be no coverage in the area
- Any other acceptable disadvantage* (2)
- 6.1.3 *Asymmetric service:* when the upload and download speeds are different.✓ (1)
- 6.1.4 *VPN* is a private network that makes use of the Internet✓ to connect the computers as if they are connected in a LAN✓. (2)
- 6.2 6.2.1 510.22 MB ✓ (Calculated as: $522464/1024$)
- Accept any value between 510 and 522 MB* (1)
- 6.2.2 *A thread* is a part of the larger program that runs independently✓ but simultaneously with other parts of the program. ✓ (2)
- 6.2.3 (a) *Multitasking* is when a computer appears to✓ run multiple programs at the same time✓ by splitting the CPU time between the tasks. ✓ (3)
- (b) *Multiprocessing* is when there is more than one CPU or core✓ and the operating system needs to divide the tasks between the processors. ✓ (2)
- 6.2.4 There is more than one processor/core/virtual core. ✓ (1)
- 6.2.5 The processor has barely been used/the processor usage is currently indicated as 3% ✓ (1)
- 6.3 6.3.1 *Artificial intelligence* refers to software that emulates human intelligence✓. (1)
- 6.3.2 A large database✓ with information supplied by an expert coach. ✓ (2)
- 6.4 6.4.1 *How does RFID tags function:*
The tag sends radio signals✓ to a receiver which identifies the wearer of the tag/user✓. (2)

- 6.4.2 *Any TWO advantages of using RFID tags in the marathon: ✓✓*
- Check progress of athletes during the race
 - Every athlete can be identified at certain points to ensure that they completed the whole race and did not take shortcuts along the road.
 - Most convenient way to track athletes

Also accept any other appropriate alternative (2)

- 6.4.3 (a) *Any ONE reason why Wi-Fi not suitable ✓*
- Wi-Fi has a short/limit range
 - Wi-Fi hotspots may not be available along the entire route

Also accept any alternative explanation (1)

- (b) *Any TWO of ✓✓*
- SMS
 - Facebook
 - mXit
 - BBM
 - whatsapp

Accept any examples of social media.

NOTE: Do not accept phone call – not minimal cost (2)

- 6.5 6.5.1 *Any ONE social media website: ✓*
- Facebook
 - Twitter
 - YouTube
 - What's Up

Also accept any other appropriate alternative (1)

- 6.5.2 Yes or No ✓

NOTE:

- The mark for yes/no is only given with a valid motivation
- Any ONE correct motivation ✓

If answered Yes:

- Only if the marshal can confirm the validity of the information
- It is available in the public domain.

If answered No:

- It was placed on the social network available for people to see - someone's own opinion
- Information may be incorrect due to cyber bullying (2)

- 6.5.3 Identity theft✓ (1)

- 6.6 6.6.1 *Any ONE advantage of the use of hyperlinks ✓:*
 - The web pages can be better organised
 - Less information on each page
 Also accept any other appropriate alternative (1)
- 6.6.2 *Any TWO features of well-designed website ✓✓*
 - Divide the layout of the opening page into well-organised sections
 - Use well described headings to identify the sections on the opening page and the content of the website
 - Use colours and animation sparingly
 - Navigation is used correctly
 Also accept any correct and relevant alternatives (2)
- 6.6.3 A URL is the unique address of a website✓ e.g. www.wikipedia.org✓

 Also accept any correct alternative examples of URL's. (2)
- 6.7 6.7.1 Biometrics✓ (1)
- 6.7.2 *Any TWO other examples of biometrics ✓✓:*
 - Retina scanner
 - Voice recognition
 - Facial recognition
 Also accept any other appropriate alternative (2)
- 6.8 6.8.1 Peer-to-peer✓ (1)
- 6.8.2 *Any TWO advantages of client-server model ✓✓:*
 - More sophisticated security
 - Better sharing of resources
 - Better performance
 - More computers can be connected to the network
 Also accept any other appropriate alternative (2)
- 6.9 6.9.1 *Packet switching:*
 - Messages are divided into smaller packages✓ and sent over the network
 - The packages are sent along the most efficient route✓
 - The packets are reassembled at the destination address to recreate the original message✓ (3)

6.9.2	(a) <i>Protocol</i> is a set of rules✓ that define the way that data will be transferred between two devices. ✓	(2)
	(b) TCP/IP✓	(1)
6.9.3	Star/Bus ✓	(1)
6.9.4	IEEE ✓	(1)
TOTAL SECTION E:		49
GRAND TOTAL:		180