INFORMATION TECHNOLOGY: PAPER I

MARKING GUIDELINES

Time: 3 hours   180 marks

These marking guidelines were used as the basis for the official IEB marking session. They were prepared for use by examiners and sub-examiners, all of whom were required to attend a rigorous standardisation meeting to ensure that the guidelines were consistently and fairly interpreted and applied in the marking of candidates' scripts.

At standardisation meetings, decisions are taken regarding the allocation of marks in the interests of fairness to all candidates in the context of an entirely summative assessment.

The IEB will not enter into any discussions or correspondence about any marking guidelines. It is acknowledged that there may be different views about some matters of emphasis or detail in the guidelines, and different interpretations of the application thereof. Hence, the specific mark allocations have been omitted.

QUESTION 1

Please note that some definitions were taken from the Webopedia Internet site: <http://www.webopedia.com>

Note: The underlined sections indicate possible mark allocations!

1.1 **WAP (Wireless Application Protocol)** – An Internet-based protocol for transferring data to small handheld devices. (2)

1.2 **Smartphone** – True smartphones have greater storage, touch screen interface, larger, higher resolution screens and the ability to run more sophisticated and useful applications than a normal cellphone. (2)

1.3 **IP Address** – An identifier for a computer or device on a TCP/IP network. The format of an IP address is a 32-bit numeric address written as four numbers separated by periods. Each number can be zero to 255, e.g. 1.160.10.240 could be an IP address. (2)

1.4 **Protocol** – It is a set of rules governing communications. An agreed-upon format for transmitting data between two devices. (2)

1.5 **Interrupt requests** are the means by which hardware components request computing time from the CPU. Each hardware device has its own' line' or interrupt to signal the CPU when it needs 'attention'. (2)

1.6 **Symbian** – An OS used in mobile devices such as smartphones. (2)

1.7 **RFID** – A small electronic circuit embedded in labels, material, etc. for the purposes of tracking and stock control. When brought near a sensor the RFID unit broadcasts its unique ID number on a low power radio. (2)

1.8 **Twitter** – A microblog – entries are limited to 140 characters. You 'follow' someone and their 'tweets' (what they post) is forwarded to you as email or, in the USA, SMS. This means you get immediate updates on their thoughts/activities as they post them. (2)

1.9 **Real-time operating systems** – Real-time operating systems are designed to respond to an event within a predetermined time. These types of operating systems are found within environments where computers are responsible for controlling systems. (2)

1.10 **Repeater** – A network device used to regenerate or replicate a signal. Repeaters are used in transmission systems to regenerate analog or digital signals distorted by transmission loss. Analog repeaters frequently can only amplify the signal while digital repeaters can reconstruct a signal to near its original quality. (2)

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QUESTION 2

2.1   Checksum OR Parity OR CRC (cyclic redundancy check)
2.2   MMS
2.3   Hotspot
2.4   Ergonomics
2.5   Linux OR Ubuntu
2.6   Avatar
2.7   USSD
2.8   URL
2.9   HSPA
2.10   Siphoning
2.11   Emulation
2.12   Router
2.13   Moodle (OR any of: Sakai, LAMS, Blackboard, WebCT)

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QUESTION 3

3.1   **entry-level –** Laptop B (i3)
       mid-range – Laptop C (i5)
       high-end – Laptop A (i7)   (3)

3.2   3.2.1   Cache memory stores pre-fetched instructions and data from slower
                RAM.   (1)

       3.2.2   Hyperthreading – 2 sets of registers for each CPU to enable fast switching
                between processors. Dual-core – 2 CPUs on a single chip/die.   (2)

3.3   3.3.1   Have a system running at full 100% and conditions like temperature are met
                (this is checked several times a minute in order to protect the CPU against
                overheating) then you will be given a **boost** that will give extra
                performance. / <u>Increase speed</u> of processor.   (1)

       3.3.2   It will give an approximate 10% increase in performance when certain
                conditions are met. So – if you have a controlled performance boost that
                will not damage the processor. If you overclock a CPU – you also get the
                extra performance but you lose the warranty if the CPU were to overheat.
                / <u>Process more intense applications</u>, such as games.   (1)

3.4   **Laptop A (Intel i7)** due to the graphics card (Integrated nVIDIA GeForce GT
       330M). You need a fast processor, lots of RAM and a good graphics card.   (3)

3.5   Backup

       3.5.1   Portable / External hard drive / Tape drive
                On-line saving   (2)

       3.5.2   The external HD must be just big enough to save all his data. The software
                programs do not need to be backed up.   (2)
                MUST provide a justification for each choice in 3.5.1.

3.5.3   Preferably on a daily basis if the work is very important. The laptop can be stolen or the hard drive can crash, then all the data will be lost. (2)

3.6   RAM

3.6.1   Laptop A – 8192 MB = 8 GB
Laptop B – 2048 MB = 2 GB
Laptop C – 3072 MB = 3 GB (3)

3.6.2   The <u>more RAM</u>, the better the performance because of <u>less virtual memory</u>. (2)

3.6.3   The size of the HD determines the <u>amount of permanent storage space</u> – how many software packages and data can be saved. RAM is just the memory and 2 GB RAM is sufficient for <u>good performance</u> in most PCs.
OR RAM stores only the currently loaded programs and data. (2)

3.6.4   Virtual Memory (1)

3.6.5   Virtual Memory – the OS allocates a <u>portion of the HD</u> to function as additional RAM. The area of the HD used to virtual memory is called a <u>swap file</u> because it swaps data, information and instructions between memory and storage. A page is the amount of data and program instructions that can swap at a given time (<u>Paging</u>). (3)

3.6.6   A 64-bit PC can work with numbers up to $2^{(64)}$.
Cache memory – keep recently used data and instructions accessible in CPU to reduce time wasted by waiting for data to come from RAM.
PCI Express – new bus standard capable of extremely fast transfer of data, e.g. PCI-E slots are used for graphic cards on the north bridge.
CPU – in the registers, the more instructions can be processed at a given time.
RAM – more data can be transferred on a single clock tick assuming the data bus is 64 bits.

(Any TWO plus motivation) (4)

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QUESTION 4

4.1   Star – fast, easy to install, easy to add nodes, reliable   (3)

4.2   Access Method

        4.2.1 CSMA/CD   (1)

        4.2.2 **CSMA/CD** (Carrier Sense Multiple Access/Collision Detection) – If two stations attempt to <u>transmit simultaneously</u>, this causes a collision, which is detected by all participating stations. After a random time interval, the messages that each station sends which <u>collided, attempt to transmit</u> again. If another collision occurs, the time intervals from which the random waiting time is selected are increased step by step.   (3)

4.3   Fibre optic cable – high speed, immune to EMI, eavesdropping, low attenuation/ Distance too great for other cable types.   (2)

4.4   4.4.1 Radio transceiver; wireless network card; UTP connection   (2)

        4.4.2 TCP/IP – http   (2)

        4.4.3 Uncapped means you can <u>download/upload as much data</u> as you like and are <u>always connected</u> to the Internet.   (2)

        4.4.4 Safety of data:

            (a) **Firewall** – <u>prevents unauthorised users</u> from <u>accessing/deleting/ copying</u> the data   (2)

            (b) **User names & Passwords** – user's profiles need a <u>login user-name</u> and are <u>password protected</u>, not anybody can access their data.   (2)

            (c) **RAID** – multiple backup disks (Striping; Mirroring; Striping with parity). It <u>duplicates data</u>, instructions, and information to improve data reliability. <u>Mirroring</u> – it writes data on two disks at the same time to duplicate the data; if one disk fails, a duplicate is available. <u>Striping</u> – splits data, instructions and information across multiple disks.   (2)

            (d) **UPS** – device which contains <u>surge protection circuits</u> and one or more batteries that <u>can provide power during temporary</u> or permanent loss of power. It connects between server/computer and a power source to provide power to the server/computer when power cuts out.   (2)

4.5   **VPN**

        4.5.1 A VPN is a <u>private Network</u> that <u>uses the Internet</u> to allow computers to connect as though they were connected in a LAN. The VPN ensures its 'privacy' in terms of who can access the data and the network by using encryption and other security measures.   (2)

4.5.2   To access school subject resources/notes/homework/submit work on-line.   (1)

4.5.3   Areas of discussion can include:
- More network and server capacity to the school's website – duplicated around the world.
- VPN being a <u>private network</u>, cloud being <u>public</u> (anyone on Internet) and pros and cons of same.
- VPN having fixed capability in terms of software and <u>licensing</u> vs. cloud allowing <u>access to other/any software and platforms</u> with <u>no licensing</u> liability for user.
- VPN <u>needs server</u> vs. cloud being a <u>public service</u> (no maintenance, etc).
- VPN <u>limited storage</u> vs. cloud <u>unlimited storage</u>.
- VPN <u>limited speed</u> vs. <u>higher speed</u> Internet with cloud, with cloud vs. a VPN.
- Cloud computing has an effect on the environment with less hardware, software, less financial burden too on individuals, companies, etc., as well as less infrastructure (hardware, software, training, managing and maintaining costs, etc.)   (Any three = 3)

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QUESTION 5

5.1   **'Cut-and-Paste' Culture** – learners <u>copy and paste data from the Internet</u> and <u>do not use books</u> and magazines anymore.   (2)

5.2   Wikipedia – a web site that is <u>based on an open encyclopaedia</u> that can be <u>edited by anyone</u>.   (2)

5.3   <u>Yes</u>, as the author still needs to <u>acknowledge the sources</u> as the ideas are not his own.   (2)

5.4   **Authenticity** – contact the author to verify or search for other related articles by the author.
Validity – look for other articles that support this article.   (2)

5.5   Electronic   (1)

5.6   Check for http**s** in the URL and a **lock-**symbol.   (2)

5.7   SSL
- Certificate linked to a specific web IP address
- Client connects to a secure site (encryption)
- Server responds by sending encryption key and digital certificate
- Client validates certificate and sends server a secret key
- After session secret keys becomes invalid.   (6)

Note: *Accept correct alternative steps.*

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QUESTION 6

6.1   Unethical – yes or no, answer correctly motivated.   (3)
        No – own photo for own use; may enhance
        Yes – trying to be dishonest; forgery; pretend to be somebody else

6.2   If you believe in accuracy, then it is wrong to alter the content of a photo in any way – it deceives the public. Yes, some insist that the extent to which a photo deceives the public, is in the eye of the beholder.

        Mark in levels – depends on the learners answer.

        Level 1: Made a statement for Art OR Fraud but NO motivations.   (1)
        Level 2: Made a statement for Art OR Fraud and attempted a motivation.   (2)
        Level 3: Made a statement for Art OR Fraud but partially motivated.   (3)
        Level 4: Made a statement for Art OR Fraud and motivated their statement fully.   (4)

        Possible good motivations:
        • Should not change historical value, e.g. 'Mona Lisa' smile
        • May not use and edit Branding and Trade marking, e.g. 'Billabong' brand – Legal issues!

6.3   Protect data: *(ANY TWO)*
        • Making backups
        • Password protect documents
        • Update software (anti-virus) and install malware detection and removal tools
        • Use a firewall   (2)

6.4   SPAM

        6.4.1   Unwanted emails, e.g. adverts   (2)

        6.4.2   Do NOT trust and open emails with attachments from people you do not know.
                 Do not respond to unfamiliar emails/open links from emails
                 Do not register on just any site   (3)

        6.4.3   No, ISP can only block what they are familiar with/anyone can send spam.
                 Spam may be hidden in other documents or emails./Register on educational site where advertisers get hold of your email address.   (3)

6.5   Yes – use Facebook often/can keep photos together with comments.
        OR   No – Gmail is more useful/provides more features.   (3)

6.6   In your report you can suggest that your old PC must be donated to the underprivileged **OR** you can suggest that it needs to be recycled.   (3)

6.7   TWO examples/explanation for each   (4)
       Possible answers:
       ICDL – know how to use Microsoft Office product sufficiently (E.g. Outlook, Spreadsheets)
       A+ – know how to fix basic hardware problems oneself

6.8   **Cyber-bullying** is common on Social Networking sites, e.g. Facebook.
       Anyone can put comments on the Net – anonymously as well or with spoofed names.
       Cyber-bullying can take many forms, not just anonymous users.

       Mark in levels (max 4)
       • **4 Marks** – Negative impact AND good motivations
       • **2 – 3 Marks** – Negative impact AND fair motivation
       • **1 Mark** – only said it can damage children's self-image (no motivation)
       Possible discussions (IT Implications):
       • Must register to add comments
       • Must have a valid email address for site to send you your access code
       • Agree to netiquette protocol
       • Can be deleted if unsavoury posts (against netiquette) are made
       • Can be reported to the administrator of the site – can be blocked and excluded
       • Can register but used a spoofed name   (4)

                                                                                                    [31]

QUESTION 7

7.1   *OOP Theory*:

      7.1.1   When the objects fields are made private/protected and are accessed/ changed via methods.   (2)

      7.1.2   **Methods (ANY TWO methods + definitions):**
            JAVA – Type methods return a value with a result type.
            JAVA – Void methods perform some action(s) and return nothing.
            Accessors will only access the private fields of a class and return their values.
            Mutators can change the values of the private fields.
            Constructors – is a class member function that is applied to a class to allocate memory for an instance of that class. If a constructor (Create method) is not explicitly declared in the class declaration, the Create method of TObject is inherited and may be used as a default constructor. The default constructor only creates the object – it does not initialise the object's data members.   (4)

      7.1.3   *ANY TWO:*
          •   Easier to <u>maintain</u>, more robust and promotes greater design and <u>code reuse</u>.
          •   OO supports a high level of <u>abstraction</u>
          •   The OO approach encourages <u>good programming techniques</u>   (2)

      7.1.4   **Inheritance** – reusability (no need for re–inventing the wheel) can add additional features to an existing class without modifying it. / faster and more effective coding / code is tested   (2)

7.2   **Class diagram:**

      7.2.1   '+' field or method is accessible outside the class
            '–' field or method is only accessible inside the class   (2)

      7.2.2   (a)   **Overload** – when methods have the same name but different parameter lists within a class so that programmers can call the method with different data.   (2)

          (b)   To provide class users with alternative methods to instantiate an object.   (2)

7.2.3 **JAVA**

```
getAverage()
Public double getAverage()
{        return (Test1 + Test2 + Test3)/3;
}
```

OR (Delphi)

```
function TMarks.getAverage: string; //real but output string!
begin
        rAverage := (Test1 + Test2 + Test3) / 3;
        result := FloatToStrF(rAverage, ffFixed, 6,2); //result always string!
end;
```
(3)

7.2.4 Make use of an **array of marks**.
An array is suitable as the programmer could use loops to process the data /
Aids readability/Array can be easily scaled to handle more data. (3)

7.3   7.3.1 **Foreign key** – establish relationships between entities. The foreign key
contains primary key values for another table. (2)

7.3.2 Vehicle (<u>regno</u>, make, model)
Mechanic (<u>employeeID</u>, name)
Repair (<u>regno</u>, <u>employeeID</u>) (5)

Vehicle	Repair	Mechanic
RegNo make model	**RegNo** **EmPID**	**EmPID** name
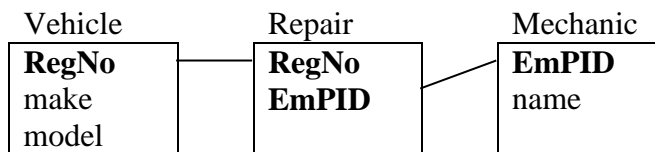
7.4   7.4.1 **Data integrity** – all of the data in the database are consistent, and satisfy all
integrity constraints.
Data redundancy – if data in the database can be found in two different
locations (direct redundancy) or if data can be calculated from other data
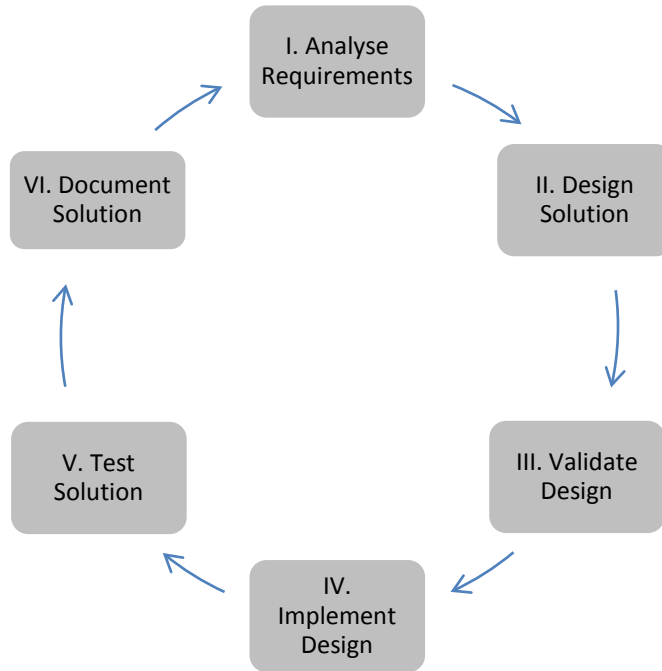items (indirect redundancy) then the data is said to contain redundancy. (4)

7.4.2 A **transitive dependency** exists when a non-primary key field depends on
another non-primary key field. (2)

7.5   The **program development cycle**: (MAX 3 marks)

I   Analyse Requirements   **Correct order: 3 marks**
II   Design Solution
III   Validate Design   **Less than 2 Mistakes: 2 marks**
IV   Implement Design
V   Test Solution   **3 Mistakes: 1 mark**
VI   Document Solution
                                      Else: 0 marks
(3)

```
                    ┌──────────────────┐
                    │  I. Analyse      │
                    │  Requirements    │
                    └──────────────────┘
        ┌──────────────────┐        ┌──────────────────┐
        │  VI. Document    │        │  II. Design      │
        │  Solution        │        │  Solution        │
        └──────────────────┘        └──────────────────┘

        ┌──────────────────┐        ┌──────────────────┐
        │  V. Test         │        │  III. Validate   │
        │  Solution        │        │  Design          │
        └──────────────────┘        └──────────────────┘
                    ┌──────────────────┐
                    │  IV.             │
                    │  Implement       │
                    │  Design          │
                    └──────────────────┘
```

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Total: 180 marks