INFORMATION TECHNOLOGY: PAPER I

MARKING GUIDELINES

Time: 3 hours

180 marks

These marking guidelines are prepared for use by examiners and sub-examiners, all of whom are required to attend a standardisation meeting to ensure that the guidelines are consistently interpreted and applied in the marking of candidates' scripts.

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. It is also recognised that, without the benefit of attendance at a standardisation meeting, there may be different interpretations of the application of the marking guidelines.

SECTION A   SHORT QUESTIONS

QUESTION 1   MULTIPLE CHOICE

1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	1.10
B	D	B	A	B	B	C	A	C	D

[10]

QUESTION 2   MATCHING COLUMNS

2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	2.10
D	H	T	A	V	N	K	O	J	E

[10]

20 marks

SECTION B   SYSTEM TECHNOLOGIES

QUESTION 3

3.1   For transferring high definition video and audio.   (2)

3.2   A technology where FOUR complete microprocessors are built into a single CPU chip.   (2)

3.3   Android/iOS   (2)

3.4   WiFi/Ethernet   (1)

3.5   No. Bluetooth connects only over a short range OR too slow.   (2)

3.6   Device A (Tablet)
(ANY THREE)
Lighter, better camera, with detachable keyboard when required, a tablet is a more suitable device for traveling around in a smaller car.   (4)

3.7   **(ANY TWO reasons – referring to specs link to scenario)**
Optical drive – installing software.
Large hard disk – storing databases and photographs.
Ethernet Interface – LAN connectivity in office.
Any other correct specs/scenario.   (4)

3.8   3.8.1   It is possible by creating a virtual Apple machine on the Windows PC. OR Virtualisation/Emulation/Dual Boot.   (1)

        3.8.2   It will probably run slower/more inefficiently than on a native Mac./ Problems accessing hardware connected to host computer/driver incompatibility.   (2)

3.9   3.9.1   A process is a running program (or part of a running program) which is in the computer's memory.   (2)

        3.9.2   An interrupt.   (1)

3.10   3.10.1   Linux OR FreeBSD; Solaris; Ubuntu; Unix   (1)

        3.10.2   (a)   Advantage: **(TWO advantages)**
                        • Free.
                        • Source code is open and can be modified.   (2)

                  (b)   Disadvantage **(TWO disadvantages)**
                        • Driver incompatibility.
                        • Some proprietary software such as MS office or Pastel Accounting will not run on Linux.
                        • If you do not have the relevant knowledge and skills to manage Linux you could have problems using the software.   (2)

3.11   In this case the handling of email and downloading at the same time. (Example: the program Internet Explorer is executing at least two different threads, one each for each tab.)   (2)

30 marks

SECTION C   INTERNET AND COMMUNICATION TECHNOLOGIES

QUESTION 4

4.1   **(ANY THREE advantages)**
        Superior Performance, more reliability, better control and security, cables are cheaper.   (3)

4.2   4.2.1   The rules and regulations which cover data transmission. In this case wireless data transmission.   (2)

        4.2.2   ADSL router + **(TWO reasons + referred to scenario)**
                  Need Internet connection to connect **to** the students on their devices.
                  Router could have ports to connect the computers and the printer.
                  Router could act as a wireless access point.
                  Router could also include firewall capabilities.   (5)

        4.2.3   **(ANY THREE characteristics)**
                  Fast/high speed; Reliable; Low latency; Easy upgradable; Immune from electromagnetic interference (EMI) and radio-frequency interference (RFI).   (3)

        4.2.4   (a)   A wireless mesh network (WMN) is a communications network made up of radio nodes organised in a mesh topology. It is also a form of wireless ad hoc network.   (1)

                  (b)   **(ANY THREE advantages)**
                          - Using fewer wires means it costs less, particularly for large areas.
                          - The more nodes you install, the bigger and faster your wireless network becomes.
                          - They rely on the same WiFi standards (802.11 a, b and g) already in place.
                          - Convenient where Ethernet wall connections are lacking, e.g. at outdoor concert venues or transportation settings.
                          - They are useful for Non-Line-of-Sight (NLoS) network configurations where wireless signals are intermittently blocked, e.g. in an amusement park.
                          - Mesh networks are "self-configuring"; the network automatically incorporates a new node into the existing structure without needing any adjustments by a network administrator.
                          - Mesh networks are "self-healing", since the network automatically finds the fastest and most reliable paths to send data, even if nodes are blocked or lose their signal.
                          - Wireless mesh configurations allow local networks to run faster, because local packets don't have to travel back to a central server.   (3)

4.3   It is **not the best way** to share photographs as BitTorrent only works when people are all interested in the same files such as movies. **Complex not private, risk viruses.**   (2)

4.4   4.4.1   Asymmetrical encryption as the bank has two different keys.   (2)

        4.4.2   Private Key   (1)

4.4.3 The digital certificate proves that the Public key actually belongs to the bank/website is that of the bank. (2)

4.4.4 Secure Sockets Layer (SSL) or Transport Layer Security – TLS (as the new version) HTTPs. (1)

4.5 4.5.1 Because it describes the selling/renting of servers and storage space OR software on a pay as you use basis (Infrastructure as a service).
OR Renting infrastructure. (2)

4.5.2 Server virtualisation is the masking of server resources, processors, and operating systems, from server users. It is the partitioning of a physical server into smaller virtual servers to help maximise your server resources. (2)

4.5.3 **(ANY TWO advantages)**
- Multiple OS environments can co-exist on the same computer.
- The virtual machine can provide an Instruction Set Architecture (ISA) that is somewhat different from that of the real machine.
- Application provision, low maintenance, high availability and disaster recovery.
- Easy to backup – one machine. (2)

4.6 4.6.1 A Virtual Private Network (VPN) is a network connection that enables you to create a secure connection over the public Internet to private networks at a remote location. (2)

4.6.2 Server virtualisation is the use of software to create a logical/virtual server on another computer or using hardware. A VPN is only the **virtual connection** between the client and the network – **remote hosts** over the Internet. (2)

4.7 4.7.1 Remotely controlling a computer involves configuring software on both the host and the target. When connected, a window is opened on the host computer showing the target computer's desktop. You can then take control of that computer. (2)

4.7.2 (a) VPN – local machine (1)

4.7.2 (b) Remote access – remote machine (1)

4.7.3 VPN – access the work computer as if the remote machine is connected in a LAN (2)

4.8 4.8.1 SEO – It is the process of maximising the number of visitors to the company's website by ensuring that the site appears high on the list of results returned by a search engine. (2)

4.8.2 **(ANY TWO)**

Content: Determined by the theme, the text on the page, and the titles and descriptions.

Authority: Does your site have good enough content to link to or do other authoritative sites use your website as a reference or cite the information that's available?

Performance: How fast is your site and does it work properly?

User Experience: How does the site look? Is it easy to navigate around? Does it look safe?

Consistent Domains: If you type in www.example.com, but then you type in just example.com and the 'www' does not redirect to www.example.com, that means the search engines are seeing two different sites.

Keywords in URL: Having keywords you're trying to rank for in your domain.

Optimise for multi-channels, e.g. Twitter, email, Facebook, LinkedIn.   (2)

4.8.3 Static – It uses HTML and CSS, these websites only provide data, you cannot edit it.

Dynamic – It uses a scripting language such as JavaScript, PHP, Ruby on Rails and ASP.NET. It is interactive, it has contact forms and search boxes.   (4)

4.9 **Intranet** – shared content on a company network/only members of the organisation who have access rights can use the content. Internal Internet

Extranet – shared content accessed by groups over several LANs via the Internet, e.g. employees of the same company across the world.

OR Intranet that is accessible to authorised outsiders.   (2)

51 marks

SECTION D   SOCIAL IMPLICATIONS

QUESTION 5

5.1   **(ANY TWO)**
- Follow a reputable person or organisation that tweets regularly about technology.
- Use RSS feeds to combine news items about technology.
- Use pinning and bookmarking tools to remember interesting articles or websites.
- Download podcasts on technology trends that you can listen to while you work.
- Use YouTube videos – there are many videos available on any aspect of technology and latest products and trends.
- Stumble Upon and Ted Talks have many relevant topics.   (2)

5.2   5.2.1   Trojan horse is a **program in which malicious or harmful code** is contained inside a program or file that is considered useful.   (2)

        5.2.2   **(ANY TWO)**
        - Only install trusted apps.
        - Use encryption on public WiFi networks.
        - Firewall.
        - Turn off wireless communication.
        - Change your Cloud services passwords.   (2)

        5.2.3   (a)   **(ANY THREE social engineering techniques)**
                      Phishing; shoulder surfing; dumpster diving; role-playing   (3)

                (b)   **(ANY THREE social engineering technique examples, link to scenario)**
                      - **Phishing** – Convincing email that is sent to the students/employees requesting to click on a link that will take the user to a fake or spoofed website.
                      - **Trojan horses** – Hackers can trick the students/employees to download a malicious file to the system.
                      - **Shoulder surfing** – The attacker uses observational techniques, such as looking over a employee's shoulder, to get information while he is inputting sensitive data, e.g. password.
                      - **Dumpster diving** – EduRoots dump items like company phone books, charts, policies, printouts of sensitive data, letterheads – the attacker use these to get information about the company.
                      - **Role-playing** – Social engineers gather information through the use of online chats, emails and phone calls.   (3)

5.3   Foreign programs can access computer resources✓ in a malicious manner. OR Programs could contain viruses or harmful software   (2)

5.4   **(ANY TWO along with a classification)**
- Students will advertise their whereabouts.
- Criminals will be able to determine their routes and patterns.
- Any other danger.   (4)

18 marks

SECTION E   **DATA AND INFORMATION MANAGEMENT AND SOLUTION DEVELOPMENT**

QUESTION 6

6.1   6.1.1   Update
                Delete
                Insert   (3)

        6.1.2   Update – Changing the tel number of John Black or Sarah Mashala.
                Delete – Deleting Vehicle 1 will delete the details of driver Marcel Roux/John or Mike.
                Insert – Buying a new vehicle will force new driver.   (3)

6.2   No driver can drive the same car on the same route.   (2)

6.3   Repeating of details of a driver, because he drives more than one car.
        OR repeating groups are flattened in the table.   (2)

6.4   Vehicle – driver OR driver – route OR vehicle - route   (2)

6.5   Normalise to **3NF** (Third Normal Form):
        1 mark per table (4 marks)
        Correct fields per table (4 marks)
        Identify PK in each table (2 marks)
        tblVehicle (VehicleID, Colour, SeatNum)
        tblDriver (DriverID, Tel)
        tblRoutes (RouteID, Distance)
        tblTravel (VehicleID, DriverID, RouteID) PK (2 marks for keys)   (10)

6.6   6.6.1   It is a field of which the values will need to be changed each year.   (1)

        6.6.2   Create a field for the year model and then use calculated field for the age.   (1)

        6.6.3   tblVehicle   (2)

        6.6.4   **Group by** will determine the maximum (**MAX**) distance for each vehicle.
                Having will display only the values which are greater and equal to 2 km.   (3)
                                                                                                               [29]

QUESTION 7

7.1   BEGIN MAIN
                INPUT month
                INPUT petrol_price   (2 marks for input)
                lowMonth = month (initialising)
                minPrice = petrol_price
                LOOP from 2 to 12 (2 marks for loop)
                        INPUT month
                        INPUT petrol_price
                        IF petrol_price < minPrice (2 marks for IF-statement)
                                THEN
                                        lowMonth = month
                                        minPrice = petrol_price
                ENDLOOP
                OUTPUT lowMonth (1 mark for output)
        END MAIN   (10)

7.2   7.2.1   Assign values to the field of the class.   (2)

        7.2.2   (a)   Solution not scalable – not easy to add more fields.
                        Sort – swapping within each array.
                        Insert/Delete – when inserting/deleting the data for a driver, you will have
                        to shift the values in each array separately.   (3)

                (b)   **Java:** String [] Name, SurName, Tel = new String[20];
                        Delphi: Name, SurName, Tel : array [1..20] of string;   (3)

7.3

Vehicle Class
−   VehicleID : int Correct fields
−   Colour : string Correct data types
−   Seats : int
+   Vehicle (VehicleID :int; Colour :string; Seats : int)
+   setVehicleID (aVehicleID: int)
+   setSeats (aSeat : int)
+   setColour (aColour : string); **THREE setters + parameters**
+   getVehicleID: int;
+   getSeats : int **THREE getters + data type**
+   getColour : string;
+   toString : string

                                                                                              (9)

7.4   **Java:**
        public void insertDriver (String n, s, t) {
                Drivers[index] = new vehicleDriver(n, s, t);
                Index ++;
        }

        OR

        Delphi:
        Procedure insertDriver (name, surname, tel :string)
        Begin
                inc(fSize);
                Drivers[fSize] := vehicleDriver.create(name, surname, tel);
        End;   (5)

                                                                                           [32]

                                                                        | **61 marks** |

                                                                        Total: 180 marks