NATIONAL SENIOR CERTIFICATE EXAMINATION
NOVEMBER 2018

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 DEFINITIONS

1.1 Software ✓ that is made available for use at no cost. ✓ (2)

1.2 The process of using a number of servers hosted on the Internet ✓ to store, manage and/or process data. ✓ OR using third-party services hosted on the Internet to store, process or manage data. Example implies the internet. (2)

1.3 The process of moving data that is no longer needed ✓ to a long-term storage device. ✓ OR a different place on the same device. (2)

1.4 An operating system feature that allows users to seemingly ✓ run multiple tasks/things at once. ✓ OR multiple programs in memory that appear to be processed simultaneously. (2)

1.5 Where two or more methods share the same name in the same class ✓ but have different parameter lists. ✓ (2)
[10]

QUESTION 2 MATCHING COLUMNS

2.1 F ✓ (1)

2.2 J ✓ (1)

2.3 B ✓ (1)

2.4 O ✓ (1)

2.5 H ✓ (1)

2.6 K ✓ (1)

2.7 M ✓ (1)

2.8 P ✓ (1)

2.9 L ✓ (1)

2.10 E ✓ (1)
[10]

20 marks

SECTION B SYSTEM TECHNOLOGIES

QUESTION 3

3.1 Two ✓ (1)

3.2 3.2.1 (a) A form of memory that is controlled by the operating system ✓ and that stores data on a secondary storage device. ✓Also accept extension to RAM here. (2)

(b) Because there is more space available on the secondary storage system ✓ (probably many GB or TB) there is never a need for as much physical memory in RAM ✓ as is needed by the OS and applications. ✓ The OS will move data between RAM and virtual memory as needed.

OR

Hard drive will be used as an extension of RAM, ✓ data can be swopped out ✓ as and when needed. ✓ (3)

3.2.2 (a) Using semiconductor chips. ACCEPT: stores electronically / electrically / flash memory / transistors (1)

(b) A hybrid drive has a traditional HDD ✓ and a small SSD. ✓ (2)

3.2.3 CPU: not possible because of socket type
RAM: probably not possible due to different type; DDR vs DDR3, slot type
HDD: interface might not be able to work with a more modern drive/
SSD: Cost too high
Monitor: old machine might only have VGA; this monitor is most likely HDMI
Any TWO for components ✓✓ for reason ✓✓ ACCEPT Cost as a basis for ideas given if valid (4)

3.2.4 The motherboard ✓ A more modern motherboard will have the required interfaces/sockets for the newer components. ✓ Do NOT accept Power Supply (2)

3.3

	Laptop	Desktop
Advantage	• Librarian can work in any part of the library ✓ • Stocktaking will be easier • Can work at home • Can work for a while if there is a power failure; even without a UPS	• Easier to upgrade hardware ✓ • More flexible in terms of initial specifications • Can build your own • Do NOT accept faster/more powerful than a laptop except if refers to for the same price
Disadvantage	• Easy to steal ✓ • Cannot upgrade hardware easily	• Fixed in one position in the library ✓ • Cannot work from home

	• Might be more expensive to purchase	• Cannot work if there is not a UPS and there is a power failure

NB: do not accept opposites of each other. (4)

3.4 3.4.1 An electronic device/application ✓ that allows a user to read an e-book. ✓ (2)

3.4.2 Includes the original text but often other illustrations/commentaries
A table of contents that hyperlinks to the different chapters
A search facility
Ability to electronically bookmark pages
Zoom in and out of the text ✓✓ Any TWO (2)

NB: This is about the eBook NOT the eBook reader! Do NOT accept things like "less bulky" or "lots of books at once", etc. – must be about characteristics of the eBook which make it friendlier to use. Beware of convenience!

3.5 3.5.1 A barcode reader OR scanner OR smartphone ✓ (1)

3.5.2 (a) No cost; data is already encoded into barcode. ✓ One mark for reason, one mark if the reason relates to the scenario. ✓ (2)

Accept any valid option ✓ that is justified. ✓

(b) Can incorporate additional data into the barcode label; can help to identify a book stolen from the library; can put the barcode where they want to. ✓✓ One mark for reason, one mark if the reason relates to the scenario. (2)

Accept any valid option ✓ that is justified. ✓

3.6 Examples could be: office applications, a database management system, any collaborative work done for displays; the issuing of books; a system to charge for lost/overdue books. SaaS would keep all the data and applications used by the library on a cloud platform.
✓✓ for explanation and ✓✓ for any two examples. Does NOT have to mention an application name e.g.: "email application" is fine, does not have to say "gmail". Accept options where candidate suggests writing new applications which could be cloud hosted. Be careful about "Excel" – they must explain that this is on the cloud. If they say Office365, that is fine. (4)

32 marks

SECTION C INTERNET AND COMMUNICATION TECHNOLOGIES

QUESTION 4

4.1 A network where all components have equal status; OR two or more computers connected together to share resources ✓ without the need for other hardware. ✓ (2)

4.2 Star – most common, inexpensive and easy to install;
mesh – introduces a level of routing that reduces broadcasts;
bus – does not need a switch.
Topology ✓ Appropriate reason ✓ (2)

4.3 4.3.1 satellite; microwave; wireless ✓ Any correct option. (1)

4.3.2 A router/cellular phone/WAP. ✓ (1)

4.4 4.4.1 A physical location ✓ where users can connect wirelessly to a network

ACCEPT: connect to the Internet/network, a device which creates a WAP (eg: SmartPhone) (1)

4.4.2

Method/Factors	Charge for time used	Charge for data used
Factors	• Download what they want in this time • Might use a lot of data • Easier to implement • Overall link performance might be compromised	• Better for the library as they know how much data is being used • Can check on each user and report how much data they used • If the library's incoming link is capped, they can ensure they do not go over cap by selling less if they are close to being capped

✓✓✓✓ Accept any TWO valid answers for each option. (4)

Allow opposites of each other in this question only!

4.5 4.5.1 HTTP – general information on web pages about the library, information, content. ✓

HTTPS – web pages where visitors need to exchange confidential information, like a login page. ✓

FTP – for website visitors to download files that might be available on the library site. ✓

WebDAV – to allow any collaborative work via the website, e.g. allowing users to upload, comment. ✓ (4)

These must refer to use of the library website – not general web use.

4.5.2 (a) Version of web that allows for collaboration between users and websites; users able to upload to the site rather than just reading content from the provider. OR Interactive website.✓ (1)

(b) Any valid features, including items such as: uploading content for users to view, library users can tag friends on posts suggesting they read a book that is advertised, allowing comments/likes for posts about new books, letting users know about events and letting them indicate if they are coming to the event or not, have a calendar of events Accept any TWO features ✓✓ with explanations relating to the scenario. ✓✓ (4)

4.5.3 (a) A type of website that contains largely static information ✓ but can be edited by the public. ✓ OR Online encyclopaedia that is editable. (2)

(b) The librarian is able to edit the wiki using editing tools; can invite contributions from users approved by her; no special skills needed once it has been set up ✓✓ Any TWO. (2)

(c) A regularly updated web page, ✓usually informal in nature and in conversational style. ✓ OR online journal. (2)

(d) The librarian controls the blog; can ensure that the content will be accurate; only relevant articles and information will appear on the blog, ✓✓ Any TWO. ACCEPT: Personal, can be edited (2)

(e) Allocate one mark for decision; ✓ one mark for justification. ✓

If no justification, NO MARKS for decision!

Example reasons for a Wiki: Allows for many users of the library to express their opinions/thoughts/reviews; content can be interlinked;

Example reasons for a blog: Librarian should be trusted to provide accurate content; users can still write reviews, but the librarian can choose the best to publish on the blog; update subscription. (2)

4.6 4.6.1 An identification system that uses a small radio transmitter ✓ for identification and tracking purposes. ✓ (2)

4.6.2 The RFID tag can be used to sound an alert ✓ via a detector at the entrance ✓ when a book is taken from the library and it can be used to trace books✓ if the tag is trackable. ✓ Any ONE reason ✓ clearly explained relating to the scenario. ✓ (2)

4.6.3 In the spine of the book; under the barcode label; under a library logo on each book, ANYWHERE where it is not visible. ✓ Accept where the tag is not detachable. (1)

4.7 4.7.1 A method of distributing digital media ✓ via a network and shared by many ✓ OR sharing a file with other computers/users in a network. Don't accept BitTorrent, but accept explanation of BitTorrent.

Important concepts here: candidate MUST show an indication that the file is split up and there are multiple servers involved. Otherwise they are describing a normal download. Give a mark for a distinction between clients sending and receiving. (2)

4.7.2

Method/Factors	Peer-to-peer file sharing	Peer-to-peer networking
• All clients are equal	• Yes	• Yes
• No server needed	• Yes	• Yes
• Clients' machines offer all services	• Yes	• Yes
• Not all clients hold data	• Files are split amongst clients	• Files are saved on clients' own machine, not split between clients
• Hardware concept vs software concept	• Software	• Hardware
• Access rights vs machine rights	• Grants access to clients' files not hardware	• Can grant access to files and hardware resources of all clients

✓✓ Any ONE correct comparison factor. (2)

4.7.3 Provided the content is not subject to copyright. ✓ (1)

4.8 4.8.1 A small text file ✓ that contains data sent from a website and is stored on the user's computer via the web browser. ✓ (2)

4.8.2 To keep track of your activity on the site: what you have viewed, browsed, purchased so that on future visits this information can be used to tailor your experience. Can also be used to store credit card and other payment information. ✓✓ Any TWO valid facts. Also accept authentication cookies if candidate mentions this and defines it correctly. (2)

4.8.3 So that users are aware that information about them is being kept and tracked. ✓ (1)

4.8.4 To keep track of data searched for by users; books enquired about/ taken out to be read; and to make recommendations for future reading ✓✓ Any TWO correct facts relevant to the scenario. (2)

4.9 4.9.1 (a) MP3. ✓Accept any valid AUDIO ONLY file format. (1)

(b) Lossless ✓ probably not that important as it is only audio, will not lose much in the conversion. ✓ Accept lossy if they justify by stating less space or a relevant fact relating to the scenario. Do NOT just accept the option – must be justified as both options are given to them! (2)

4.9.2

Method/Factors	Streaming	Downloads
Factor 1	• Multiple users all trying to stream books simultaneously might saturate the link – poor performance.	• Library can schedule downloads to happen at times when the connection link is quiet – balance usage of link.
Factor 2	• If home user does not have a fast enough link, the streaming will be ineffective.	• Can listen to book multiple times once downloaded, will not have to restream it.

✓✓✓✓ Any TWO correct comparison factors applied to streaming and downloads. (4)

4.9.3 NO. ✓ Copyright laws will probably prevent the recordings being made legally; ✓

OR

YES ✓ if the book is not under copyright or in the public domain. ✓ OR permission has been obtained from the author OR the book is older than 50 years OR out of print, which means you should check with the publisher.

ONE mark for YES/NO ✓ with a justified answer. ✓ **Do not award any marks if only YES or NO is given.** (2)

56 marks

SECTION D SOCIAL IMPLICATIONS

QUESTION 5

5.1 A number (sometimes thousands) of compromised computers (BotNets)✓ (often via a Trojan) are used to flood a site with traffic ✓ causing the website to become unavailable. ✓ (3)

5.2 5.2.1 A malicious attack that prevents a user from accessing their data or computer, ✓ by either blocking access to or by encrypting the files ✓ until a ransom is paid when a decryption key is (hopefully) sent to the user. ✓ This is NOT about stealing data. What happened, how, and how will it be fixed/get the data back are the important stages. (3)

5.2.2 Make use of a web/email solution to inspect all incoming mail/web pages to prevent ransomware reaching end users. Duplicate this on end-user machines. High levels of user vigilance on incoming mail; close ports on firewall; educate users. ✓✓ Accept any TWO. Accept antivirus solution, updating antivirus, updating OS. Do NOT accept backup (this won't prevent an attack – it will help you recover). (2)

5.3 Having your own staff involved with cybersecurity will ensure their and therefore the organisation's knowledge is up to date; will keep security at the heart of the business; application development will benefit from the latest knowledge of how software can be compromised; in the long term, the organisation will have a more unified approach to the software development lifecycle; internal policies are likely to be tighter and employees more alert to cyber attacks; will improve employee well-being by upskilling them. ✓✓ Accept any TWO. (2)

5.4 Needs to be long (8+ characters); combination of letters and numbers/ characters; not a word/easily detectable item. ✓✓ Accept any TWO correct techniques. Complexity. (2)

5.5 5.5.1 Information overload in a human context refers to the difficulty in understanding an issue/making effective decisions when there is too much information about the issue. Information overload leads to a reduction in the quality of decisions a person makes. Any ONE correct answer. (1)

5.5.2 It might affect your judgement ✓ in terms of dealing with important issues in the village. ✓ Answer must indicate that judgement might be impaired in some way. Accept valid answers that show the candidate has thought about the issues. Accept: no time for other activities. (2)

15 marks

SECTION E DATA AND INFORMATION MANAGEMENT AND SOLUTION DEVELOPMENT

QUESTION 6

6.1 6.1.1 Composite/compound/concatenated key. ✓ (1)

6.1.2 Books can only exist in the database ✓ if they are on loan to someone. ✓ (2)

6.1.3 Update ✓ and Delete ✓ anomaly. (2)

6.2 6.2.1 Partial dependency – a field is dependent on part ✓ of the primary key. ✓ (2)

6.2.2 Transitive dependency – a field is dependent ✓ on a non-key field. ✓ (2)

6.3 6.3.1 An update query. ✓ (1)

6.3.2 SELECT DaysOverdue * 0.50 ✓ AS FinePayable ✓

FROM tblBooks✓

WHERE DaysOverdue ✓ > 0 ✓ (Accept: >=1, <>0)

✓ Accept correct solutions for MySQL/JavaDB. (5)

6.3.3 The field will have to be updated ✓ daily ✓; can easily have a wrong value entered (user error). (2)

6.3.4 (a) Store the date a book should be returned in the database. ✓ Accept date to be returned or date issued. For either, must link to valid explanation in (b) below. (1)

(b) When a book is being returned, the date in this field will be checked against the current date. ✓ The difference between the two dates can be calculated and if this is a positive number, this will be the number of days the book is overdue. ✓ (2)

6.4 6.4.1 (a) A security-relevant chronological record of all changes made to a database and by whom. ✓ (1)

(b) If data is changed/deleted inappropriately, ✓the audit trail will show when this happened, by which user, etc. ✓ OR use an audit trail to roll back the database. Who? What? When? Roll-back? Any two of these. (2)

6.4.2 By setting up correct user-access permissions. ✓ Accept Administrator Privileges (1)

6.4.3 (a) Two identical sets of data ✓ (1)

(b) As the two data sets should always be identical: if one is different after an operation, ✓ you will need to investigate why. ✓ (2)

[27]

QUESTION 7

7.1

Book
– Integer bookID – String title – String genre – Integer timesBorrowed
+Book (Integer b, String t, String g, Integer tb) +getGenre() : String +getTimesBorrowed() : Integer +setTitle(String t) : void +toString() : String

Mark Allocation:
✓ Name of class
✓ All fields private
✓ All fields correctly named and typed
✓ All methods public
✓ Constructor has correct name, ✓ correct number of parameters with correct names and types ✓ Accept Constructor/Name of class/Create.
✓✓ All accessor and mutators correctly shown
✓ toString of correct type (10)
Ignore any static methods
If written code: mark just the method headers.

7.2 7.2.1 A series of steps ✓ to solve a problem. ✓ This is NOT about representing an algorithm – just a definition of what it is. (2)

7.2.2 Because an algorithm is written in pseudocode ✓ that can be translated into any programming language for implementation. ✓ (2)

7.2.3

```
position ← 0
popular ← 0
size ← number of elements in bookArr
popular ← bookArr[0].getTimesBorrowed() ✓

//action section
loop i ← 1 to size ✓
begin
        if bookArr[i].getTimesBorrowed()> popular ✓
        begin
                popular ← bookArr[i].getTimesBorrowed() ✓
                position ← i ✓
        end if
end loop

return "The most popular genre is:" + bookArr[position].getGenre() ✓
```

Accept valid alternatives. There are a number of possible solutions! Marks allocated accordingly.

Initialise popular ✓

Loop ✓ – check merits of loop: from 1 vs from 0

If ✓ Provided correct comparison

✓ store of popular

✓store position

✓ return correct value

Reasonable attempt to assign value to Popular, give a mark for the return even if incorrect. (6)

7.3

Step Number	size	i	k	p	intArr							intArr[i] = intArr[k]?
					[0]	[1]	[2]	[3]	[4]	[5]	[6]	
					1	2	2	4	6	9	11	
1	7											
2		0										
3			1									
4												F
3			2									
4												F
3			3									
4												F
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5				2								
6								2				✓
5				3								
6									2			✓
5				4								
6										2		✓
5				5*								
6											2	✓
7	6 ✓											

* ✓✓ for all 4 values correct (2, 3, 4 and 5). If candidate has at least the first value correct (i.e. the '2') allocate one mark.
Check for things happening at the right time!

(10)
[30]

57 marks

Total: 180 Marks