NATIONAL SENIOR CERTIFICATE EXAMINATION
NOVEMBER 2023

INFORMATION TECHNOLOGY: PAPER II

MARKING GUIDELINES

Time: 3 hours 150 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 Interpreter

1.2 Decode

1.3 Broadcast

1.4 Virtual memory

1.5 Defragmentation

1.6 Payload

1.7 ADSL

1.8 Anti-malware /Anti-virus

1.9 HTTPS

1.10 TOR.Accept VPN

SECTION B SYSTEM TECHNOLOGIES

QUESTION 2

2.1 L

2.2 C

2.3 I

2.4 N

2.5 M

2.6 K

2.7 D

2.8 O

2.9 B

2.10 A

QUESTION 3

3.1 Mouse/keyboard/printer. Accept any correct device for a server, so this would exclude any gaming specific or similar devices which would be suitable for a desktop.

3.2

RAM chip capacity	Total amount of RAM
2 GB	8 × 2 = 16 GB
32 GB	8 × 32 = 256 GB

Mark allocation: One mark for number of slots (8 each time) and one mark for both correct answers: 16 GB and 256 GB.

3.3 3.3.1

Function 1:	Provide a user interface.
Function 2:	Load and execute applications.
Function 3:	Manage computer's resources.

3.3.2

Name of operating system	Justification for choice	License model used
Any valid OS for a server: e.g.: Windows OR Linux	Justification must be valid for OS choice. e.g.: widely used, lots of support no cost	Model must match OS chosen. e.g.: Proprietary open source

3.4 3.4.1 Yes

A co-processor is defined as being any additional processor added in order to assist a CPU. This can be a second CPU, a GPU, a math co-processor.

If candidate's justification is missing or not relevant, no mark for the 'YES'/'NO' portion of the answer.

3.4.2 Multitasking

Definition:	More than one task being performed at one time. The execution of more than one program simultaneously. Concurrent execution of multiple tasks. Accept any correct definition: focus is on different tasks/programs at the same time.
Example:	Running multiple browsers at the same time. Running Word and Excel at the same time. Running a browser and a music program at the same time. Accept any valid example: focus is on multiple programs/tasks, must mention different programs/ tasks.

Multithreading

Definition:	Allows for two or more instruction threads to be executed independently. Ability to break a single process into multiple threads of execution and run them simultaneously. A single set of code being able to be broken into separate threads and run by multiple processors at the same time. Accept any correct definition: focus is on multiple parts of ONE program being executed simultaneously.
Example:	Playing a video and downloading it at the same time. Browser accepting input from the user and is fetching data at the same time. Multiple tabs operating in a browser at the same time Accept any valid example. Focus is on different parts of the SAME program/task happening at the same time.

3.4.3 (a) SRAM/Static RAM

(b) No

L3 Cache RAM is part of the motherboard construction, not modular, so cannot be swapped out/changed/increased/ improved.

Unlikely to be able to accept 'YES' as an answer but consider the justification.

If candidate's justification is missing or not relevant, no mark for the 'YES'/'NO' portion of the answer.

(c) L1 is more likely not to be shared as it is smaller and closer to the CPU, OR: more likely to have the instruction(s) which a particular core is wanting.

3.4.4 (a) TRUE [X] FALSE [ ]

Reason	A graphics card needs RAM in order to manipulate the graphics – if there is only an onboard card, the system RAM is all that will be available.

(b) No

For a server, the onboard graphics card will be sufficient; there will not be graphics-demanding applications run on a server; a server should have sufficient RAM installed, won't notice the difference in performance.

If candidate answers 'YES' the motivation must be very specific and relevant to a server use, not related to normal desktop use. No reasons related to gaming or the like are acceptable.

If candidate's justification is missing or not relevant, no mark for the 'YES'/'NO' portion of the answer.

(c)

Component 1:	GPU
Component 2:	VRAM

Accept any two correct components which will affect PERFORMANCE.

SECTION C INTERNET AND COMMUNICATION TECHNOLOGIES

QUESTION 4 THEORY

Question	4.1	4.2	4.3	4.4	4.5
Answer	B	C	A	D	B

4.6 4.6.1

Characteristic	**Lossy**	**Lossless**
Removes as much data as possible from the original file	X	
Doesn't allow for significant storage savings		X
Data quality, especially for video images, is compromised	X	

4.6.2

Characteristic	**Explanation**
Removes as much data as possible from the original file	Lossy – The reason behind compressing files is to make them smaller; lossy removes as much as possible to make the file as small as possible.
Doesn't allow for significant storage savings	Lossless – Lossless does not compress the file by any significant factor and therefore the files will not be smaller, therefore not saving on storage.
Data quality, especially for video images, is compromised.	Lossy – In order to reduce the size of the file, data is removed and therefore the quality of the image will be reduced as some parts of the image are no longer there.

Accept correct explanations for TWO characteristics provided they align with the choice of either lossy or lossless in Question 4.6.1.

QUESTION 5

5.1 5.1.1 To allow for nodes to connect to a wireless network; creates a wireless LAN; provides wireless connectivity to nodes. DO NOT ACCEPT: connects to the Internet.

5.1.2

Advantage:	Less cable required (no LAN ports). Smaller central switch. Allow for mobility and flexibility in connectivity. Easy for multiple users to connect. Accept any correct advantage.
Disadvantage:	A device without a WLAN card will not be able to connect to the network. Less secure than cabled network. Susceptible to interference from other wireless devices. Slower transfer rates. Accept any correct disadvantage.

If the advantage/disadvantage are opposites of each other; not marks allocated.

5.1.3

Topology name:	Star OR Hybrid
Reason:	Central device is being used to connect all nodes to the core of the network. OR Router and switch are in a bus and devices connect to the switch in a star Accept any correct reason.

Accept hybrid provided the reason is correct and **MUST** mention two topologies as part of the answer.

5.2 5.2.1 Encrypted: data packets which travel across the network are unable to be read as plain text; original data is converted into ciphertext; readable format vs encoded format.

5.2.2 (a) 2^{256}

(b) Symmetric encryption uses the same key to encrypt and decrypt data packets. Therefore, if the key which was used to encrypt the packets is known by a third party, they will be able to decrypt the data. This poses a security threat. Uses one private key.

(c)

Technique:	Asymmetric encryption
Improvement:	Different keys are used to encrypt and decrypt data packets. Public key is used to encrypt, private key is used to decrypt.

(d) Should the decryption key (private key) be lost, data packets will not be able to be decrypted.
Asymmetric is slower than symmetric encryption.

Any correct answer

5.3 5.3.1 A firewall is designed to prevent unwanted access to private data on a network; to filter packets on a network; provides protection from external attacks. Accept any correct answer: focus is on PROTECTION and FILTERING of traffic.

5.3.2

Reason 1:	Gym users are going to be able to connect to the network. There is a website connected to the network. Second mark is to be allocated for the explanation of the reason; reference to the particular type of user. For example: Gym users connecting to the network could pose a risk; OR Fairly Fit might want to block certain traffic types.
Reason 2:	The network is being used for customers to purchase goods. Second mark is to be allocated for the explanation of the reason. For example: If customers are using the website to purchase goods, there needs to be a level of protection against hacking the store.

Accept correct reasons which relate to the scenario. If the reasons given do not relate to the scenario, no marks allocated.

5.4 5.4.1 Because it offers users the ability to interact with it in a variety of ways.

5.4.2

Type 1:	A review of the food ordered A review of the service received (good/bad)
Type 2:	Photographs of the food Video of the food being eaten

Accept two valid information types commonly used on social media website.

5.4.3

Platform 1:	Instagram/Twitter/Mastodon/Reddit
Platform 2:	YouTube/Pinterest/TikTok

Accept any two valid social media platforms.

5.4 5.4.4 (a)

Server-side:	The script is run on the server (remote) and the result is sent to the client's browser.
Client-side:	The script is sent to the client's browser and is executed locally and the result shown directly in the browser.

(b)

Feature 1:	A calculator to add up the value of items purchased.
Feature 2:	Login screen – entering username and password for validation.

SECTION D SOCIAL IMPLICATIONS

QUESTION 6

6.1 Anti-virus software, anti-malware software, local firewall (windows firewall). Accept any ONE correct answer.

6.2

Reason 1:	Library of music soundtracks to use without concerns over copyright. Easy to create video content. Videos are short Videos are more engaging than text (as in Twitter)
Reason 2:	Algorithms which promote content. Algorithms which provide similar content to users. Popular during COVID

6.3

Information type	**Useful nature**
Location of user	A foreign government can use this to determine movement of citizens in various countries.
Age	Can create age profiles of the users in order to target different age groups if necessary.
What other apps are used	Apps can detect what other apps are currently being used or are installed on a device; useful to profile users.
What websites visited	Apps can detect browser activity to likewise profile users and potentially target them.

Accept any three correct information types which could be accessed by an app on a device. Justifications must match the information type, or no marks allocated.

6.4

1:	Use a VPN to bypass campus firewalls
2:	Use own mobile data connection

6.5 No

Not logging in to an app merely restricts certain functionality of the app, it does not prevent the app from passing information of clips watched, location, etc. back to the app's servers.

'YES' is an unlikely answer here, but check reasoning.
If candidate's justification is missing or not relevant, no mark for the 'YES'/'NO' portion of the answer.

6.6

Tip 1:	Create secure user logins/credentials. Encrypt data that is transmitted.
Tip 2:	Ensure that the app is not interacting with other apps. Protect any data that is stored within the app.

Accept any two correct tips which will enhance security of data.

SECTION E DATA AND INFORMATION MANAGEMENT AND SOLUTION DEVELOPMENT

QUESTION 7

7.1 7.1.1

Outdated data:	This is where data stored in the data base is no longer valid; the actual field values have changed but have not been updated in the database. **Example**: customer has changed their phone number but this has not been changed in the database, the value in the phone number field is out of date.
Invalidated data:	This is where data is being entered into a database but the data which is entered does not pass a validation process. **Example**: a customer's ID number is being entered and it does not contain the correct number of digits.

Ensure that the examples relate to data which is likely to be stored in the **Fairly fit** database. Do not allocate marks for the example if this is not the case.

7.1.2 (a) SQL injection

(b) This line of code will return all the details stored in tblCustomers.

(c) This will happen because the WHERE clause will always be true even though the customerID is incorrect because 1 = 1 will always be true and the conditions are linked with an OR statement.

(d) The fields on the website where users are able to enter any information should be protected against allowing SQL statements to be executed. Accept: being able to use prepared SQL statements.

7.2 7.2.1 128 bits

7.2.2 (a) 2001:db8:3c4d:15:0:0:2f:b

for all parts of IP address present, for leading zeros correctly removed.

(b) 2001 – will require 16 bits (4 × 4)
db8 – will require 12 bits (4 × 3)
3c4d – will require 16 bits (4 × 4)
15 – will require 8 bits (4 × 2)
0 – will require 4 bits (4 × 1)
0 – will require 4 bits (4 × 1)
2f – will require 8 bits (4 × 2)
B – will require 4 bits (4 × 1)

Therefore: 16 + 12 + 16 + 8 + 4 + 4 + 8 + 4 = **72** bits
mark allocation: for two values at 16, for one value at 12, for values at 4 and 8
NB: If candidate has incorrectly shortened the IP address in 7.2.2 (a) then the logic used and carried to this question must be acknowledged. Do not double penalise.

(c) Removing trailing zeros will have a significant effect on the value of the set of 4 hexadecimal characters. This will lead to incorrectness. If we look at ff00 as an example, with the two zeros removed, it will not be possible to determine if the ff are meant to be at the left or right hand side of the set of 4 characters. Accept if candidates refer to most/least significant bits.

QUESTION 8

8.1

Stock
Fields: - desctiption : string - stockQuantity : integer - costPrice : real - sellingPrice : real - healthyFood : boolean + MARKUP = 80 : integer - totalStock : integer - totalCost : real - totalSales : real
Methods: + Constructor(d:string, sQ:integer, cp: real, sP: real, hF: boolean) + getHealthyFood() : boolean + getStockQuantity() : real + setDescription(dIn:string) : void + getTotalStock() : integer + toString() : string

Mark allocation:

markup shown as public, in capitals and shown as static (underlined)
markup has value set
class methods all shown as static (underlined)
constructor with correct parameters
accessors and mutators all correct and typed/void
class method shown as static (underlined)
toString correct and typed

8.2 8.2.1 (a) getTotalStock()

(b)

Line	totalStock	size	count	alert	alertLevel	k	sArr[k].getHealthyFood() = 'true' ?	alertlevel < 0.8?	Return
1	30								
2		4							
3			0						
4					0.0				
5				Level OK					
6						0			
7							True		
8			1						
6						1			
7							True		
8			2						
6						2			
7							True		
8			3						
6						3			
7							False		
9					0.1				
10								True	
11				Level Low					
12									Level Low

Mark allocation:

Initial values set as indicated on grid (4 marks)
Count column; 1,2,3
k column: 0,1,2,3
line 6 test : three × True
line 6 test : one × False
line 8 : alertlevel set correctly
line 9 test : set to True
line 10 : return set to True

8.2.2 (a) Each time the line is executed the value of count is being increased by 1. This is incorrect as it should be increased by the stockQuantity for each stock item.

(b) count = count + sArr[k].getStockQuantity

8.3

M	G	W	M'	M.G	M'GW	M.G + M'GW	RESULT True/False
0	0	0	1	0	0	0	F
0	0	1	1	0	0	0	F
0	1	0	1	0	0	0	F
0	1	1	1	0	1	1	T
1	0	0	0	0	0	0	F
1	0	1	0	0	0	0	F
1	1	0	0	1	0	1	T
1	1	1	0	1	0	1	T

Mark Allocation:

M' correct
M.G correct
M'GW correct
M.G + M'GW correct: one mark for zeros pattern, one mark for ones pattern
Result column matched M.G + M'GW column

Total: 150 marks