NATIONAL SENIOR CERTIFICATE EXAMINATION
NOVEMBER 2022

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 Protocol

1.2 Optical Character Recognition (OCR)

1.3 Algorithm/Pseudocode/Flowchart

1.4 Control Unit

1.5 Latency
Do not accept lag

1.6 TKIP

1.7 Overclocking
Accept clock manipulation

1.8 Botnet/Zombie Army/Network
Do not accept bot

1.9 Bus
Accept anything so long as it has "bus"

1.10 Fibre Optic/Fibre

SECTION B SYSTEM TECHNOLOGIES

QUESTION 2 THEORY

2.1 2.1.1

Stage 1	Fetch	Fetch
Stage 2	Decode	Decode
Stage 3	Execute	Transfer
Stage 4	Store	Execute

Allow for stage 3 and 4 to be interchangeable

2.1.2 Fetch and Store. Accept first and last, accept stage 1 and 4

2.1.3 (a) To perform all logical and arithmetic processes/calculations.

(b) Execute. Accept stage 3

2.2 2.2.1 Because they use instructions which are English-like/human and easy for programmers to understand. Accept: allow for abstraction

2.2.2 Source code. Do not accept program code, java program

2.2.3 Compiler/Interpreter/Translator

2.2.4 Assembly/machine code. Accept Assembler

QUESTION 3 APPLICATION

3.1 3.1.1 The ability to change/upgrade components of a computer; can remove a component and replace it with another

3.1.2

Component	Explanation
Power supply	Power supply can be removed and a new one installed and connected.
USB 1.0 ports	Can't upgrade these as they are part of the motherboard.
CPU	CPU can usually be unplugged and changed but needs to be of the same socket type.

3.2 3.2.1 Because there is only one core

3.2.2 (a) To perform arithmetic calculations separately from the main CPU OR relieve the CPU of the task of doing arithmetic calculations.

(b) NO. A motherboard that has a Pentium 4 processor is unlikely to have a co-processor slot. Accept: Motherboard won't support it, reference to scenario – not math co-processor not needed, co-processor is already integrated in CPU.

3.2.3 (a) A technology that allows for the simulation of a second set of registers OR two logical cores (first mark). Allows for pre-fetched instructions from RAM, Accept: Allows for context switching or a simulation of logical cores.

(b) While the CPU is busy processing one instruction, the next can be loaded into the second set of registers ready to be processed.

3.3 3.3.1 **Primary storage:** Data/programs/instructions currently being processed. Accept: Currently **open** application(s) or program(s)/data files

Secondary storage: Data that needs to be stored permanently for future retrieval. Accept: list of applications, image files, etc.

3.3.2 (a)

Similarity:	Cheaper per byte than RAM; both are non-volatile storage	Any one correct answer
	Both use SATA interface	
Difference:	HDD uses magnetic disks for storage	Any one correct answer
	SSD has no moving parts	

Do not accept similarity – secondary storage, large amounts of data.
Do not accept difference – cheaper, without a reason.

(b) Because the access time is much lower on an SSD, the drive will provide data to the CPU faster than when using an HDD.

Accept correct answers that suggest that the CPU will get data faster with an SSD.

3.4 3.4.1 A signal sent to the CPU by either a hardware device or a piece of software indicating it needs the attention of the CPU.

3.4.2

Device	**Suggested IRQ**	Explanation
Keyboard	1	Most important input device, can work without a mouse, but keyboard is essential for operation. Accept: Keyboard is input which needs to be accessed immediately.
USB Port	5	Allows other external devices a fairly high level of attention, but not to the detriment of most important. Accept: device only needs to be accessed when used, not all the time.
System Timer/Clock	0	Most important device, controls all other devices/running of machine, must have the CPU attention immediately.
HDD Controller	15	Storage isn't used all the time, is extremely fast in any event, doesn't need a higher level of priority, waits for CPU to send or request data.

SECTION C INTERNET AND COMMUNICATION TECHNOLOGIES

QUESTION 4 THEORY

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

4.6

Protocol	**Use**
SMTP	Sending emails
HTTP	Used to transfer hypermedia data over the web Accept: access web, browse web, transfer pages, NOT display web
FTP	Used to transfer files
WebDav	Allows users to collaboratively edit and manage files on remote web servers

4.7

Device 1:	Fingerprint scanner built into keyboard
Device 2:	Use webcam for facial recognition
Accept any two correct techniques. MUST name a device. Accept scanner, but not scan.	

QUESTION 5 APPLICATION

5.1 5.1.1 The arrangement of nodes to form a network, OR the arrangement of different types of networks linked together. Accept layout representation. Not definition of network.

5.1.2

Advantage:	Easy to add nodes to existing network.
	Simple to set up. Commonly used, one node crashes not affect, etc.
Disadvantage:	Lots of cable required.
	Expensive switch needed to combine. **Central** device failure is a problem
Accept any correct advantage/disadvantage. Do not accept expensive on its own	

5.1.3 1 = Ring, 2 = Bus

5.2 5.2.1 (a) A **technology** for connecting wired devices in a LAN or WAN

(b) YES
The scenario suggests that there is one PC at the moment and three more will be added. Mobile devices will not need a UTP port.

(c) Mb/s. Accept Gb/s. Do not accept MB/s or GB/s Accept Mbps

(d) Different types of devices that will connect to Device A or Device B might have network cards that are able to transmit at different speeds OR allows for devices to connect at different speeds. Distinction: multiple devices, different speeds. Accept: Ensure compatibility between device and switch
Example: Network card on desktop/laptop, router, firewall. Accept any one correct device. Include: IP Camera, cameras, network printer. Do not accept anything mobile.

5.2.2 (a) YES

Scenario suggests that there will be mobile devices connected to the network – they will need a wireless network.

(b) Wireless access point. Accept wireless router. Do not accept router on its own.

(c) It will connect to a port on the device (switch). Accept plug into the switch. Do not accept "connect with a cable", must refer to port or switch.

5.2.3 So that the switch knows which device is connected to which port for correct data transmission. To know source/destination address for packets.

5.2.4

Advantage	Item connected will not need its own power supply. Accept: Won't need to add more plug points. Do not accept: charging devices, providing electricity, gives better cable management
Disadvantage	If the switch fails, the device will not be powered. Accept cable damage: might not get power as well as data. Accept high-spec devices might not be able to be powered by POE.
Accept correct advantages/disadvantages which show the candidate has thought about how the explained principal will affect the network.	

5.3 5.3.1 YES/NO

Justification must match answer – for example:
YES: to maintain security; prevent non-passengers using the connection.

NO: too complex to give passengers a password over a short trip; vehicle is moving, so little chance of someone else using the network. Accept: don't want driver to be distracted while driving.

– one for each reason which justifies correctly.

5.3.2

	Allow	**Block**
Name of activity 1	Web browsing VOIP/Data calls/Whatsapp calls, streaming	Large file downloads Block: streaming, VPN/TOR. Don't accept Dark Web.
Name of activity 2	Email	Any illegal content

5.3.3 Allow answers for either method, 1 or 2
Justification must be valid.

For example:
Method 1: easy to use one device; most phones are 4G/5G which is better than 3G router.

Method 2: passenger use won't interfere with what driver is doing on his device. Driver device not at risk.

SECTION D SOCIAL IMPLICATIONS

QUESTION 6

6.1 Protection of Personal Information Act

6.2 Accept any two valid methods: Examples: click-wrap agreement when installing the app/when ordering a ride; send a text message when a new customer signs up; have a notice in the vehicle that is clearly readable by the passenger; include text when sending each passenger their bill for each ride, terms and conditions, emails. Do not accept AUP

6.3 Accept valid items and usages. Examples:

A: Data item	**B: Lawful use**
Customer Name	To maintain a database of customers
Mobile phone number	Send info about special deals via SMS
Home/work address	Inform customers about special deals in their area
Email Address	Send customers regular emails about new services being offered/newsletter
Location	Required for functionality
Credit card details	Transaction processing in future
Rating	Use to prevent users from getting a driver they were unhappy with previously
Search history	Targeted advertising

6.4

A: Security measure	**B: Explanation**
Database password	Only employees who have the password will be able to process data.
Regular database edits/ updates	Remove the details of customers who no longer use the app/service so you don't hold info you don't need to hold.
Do not print out information relating to clients	Prevents people easily gaining access to customer information.

List of acceptable measures:
Firewall
Backup
UPS
Biometrics
Secure WiFi connection
Anti-malware
Physical protection (security gates, RAID)
Encryption
2FA
Disable/change passwords
Share-level authentication
Limit user privileges.
MUST have explanations which match.

Accept two correct techniques and explanations which relate to each other as well as the **requirements of the Act**.

6.5 Action 1: Inform the information regulator. Accept authorities (police, etc.)
Action 2: Inform the data subject (customer)

SECTION E DATA AND INFORMATION MANAGEMENT AND SOLUTION DEVELOPMENT

QUESTION 7

7.1 7.1.1 Sign bit

7.1.2

Largest	Smallest
$2^{n-1} - 1$	-2^{n-1}

7.1.3 (a) 23

(b) $2^{23} - 1 = 8\,388\,607$ Ignore final value if it is wrong but rest is correct. If formula incorrect, but final value correct (somehow!) one mark only.

7.2 7.2.1

Driver
Fields: # name : string # vehicle : string # registration: string # chargeRate : real
Methods: + Constructor (n : string, v : string, r : string, cR : real) +getChargeRate() : real +setChargeRate(cRIn : real) +toString() : string

PremiumDriver
Fields: -rArr : Rating [ ] -size : integer
Methods: + Constructor (n : string, v : string, r : string, cR : real; rtG : **Rating** [ ], s : integer) Give a mark for child parameters even if parent are missing. +setRating(dArr : **Rating** [ ]) +toString() : string

Mark Allocation:
Array field: Accept what candidate has shown, provided it makes sense as a depiction of an array.
Fields protected/private, named and typed correctly in both classes:
Methods public in both classes:
Driver: for correct Constructor for accessor and mutator, for toString() with correct type
PremiumDriver Class: for Constructor with parent fields and child fields in addition; for correct type and parameter for mutator for showing inheritance relationship correctly. (arrow, open)
Both classes: Penalise once for () missing at toString() method.

7.2.2 (a) public **void** setRating(**int inR**)

procedure setRating(inR : integer)
No marks if algorithm shown.

(b)
```
public void changeRating(int inInd, int inNewR)
{
    ratings[s].setRating(inNewR);

}
```

```
function TRating.changeRating(inInd : integer, inNewR :
integer);
begin
    ratings[s].setRating(inNewR);
end
```

(c) (i) To return one PremiumDriver element from the array of objects at position i.

(ii) To cast the array element to type PremiumDriver. Do not accept parsing/converting : only cast/casting.

7.2.3 Yes

The PremiumDriver class inherits from the Driver class and they both have a method named toString() – the one in the PremiumDriver class will override the other for an inherited object.

for naming the method and for showing the link between the two classes.

7.2.4 Make the chargeRate field a static constant.

7.3 7.3.1

Line	size	avg	total	count	k	arr[k].getDate = 24/12/2021 ?	Return
	5						
1		0.0					
2			0				
3				0			
4					0		
5						T	
6			3				
7				1			
4					1		
5						F must be second iteration	
8			-2				
4					2		
5						T	
6			0				
7				2			
4					3		
5						T	
6			4				
7				3			
4					4		
5						T	
6			6				
7				4			
9		1.5					
10							1.5
					Accept ending at 5		

Note for column "k": depending on how the candidate interpreted the algorithm "0 to size - 1" as either " < size -1" or "<= size-1" this will allow for k to be either 4 or 5

for all correct line numbers from 4 onwards, last two lines, 9,10

(10)

7.3.2 (a) Line 8

(b) The subtraction in line 8 should not happen. If the condition fails, there shouldn't be any code executed. If candidate picks up a different error that is actually something incorrect, then accept their justification PROVIDED it is correct.

(c) Have an additional parameter that will receive the date when the method is called. Accept input rather than parameter. Do not accept a fixed number, but accept FINAL.

7.4 7.4.1

T	A	R	T.A	T.R	T.A + T.R	T.A.R	(T.A + T.R) + T.A.R	RESULT True/False
0	0	0	0	0	0	0	0	F
0	0	1	0	0	0	0	0	F
0	1	0	0	0	0	0	0	F
0	1	1	0	0	0	0	0	F
1	0	0	0	0	0	0	0	F
1	0	1	0	1	1	0	1	T
1	1	0	1	0	1	0	1	T
1	1	1	1	1	1	1	1	T

Mark Allocation:
Each column
T.A
T.R
T.A + T.R
T.A.R
(T.A + T.R) + T.A.R
Result column: for 5 × F and for 3 × T

7.4.2 F(T,A,R) = T.A'.R + T.A.R' + T.A.R
If candidate has incorrect outcomes in truth table, allocate the marks provided the function correlates to their true outcomes.

Total: 150 marks