INTERNATIONAL SECONDARY CERTIFICATE EXAMINATION
NOVEMBER 2023

COMPUTER SCIENCE: 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 Validation

1.2 Big Data

1.3 Compiling

1.4 Overriding / Overridden method

1.5 Data Bus

1.6 NVMe

SECTION B SYSTEM TECHNOLOGIES

QUESTION 2 THEORY

2.1 2.1.1 3.2 GHz × 1000 = 3200 MHz

2.1.2 CPU can change its clock multiplication factor / CPU can overclock itself to increase its speed under heavy processing load.

2.1.3 The CPU has many cores and runs at high frequency causing a lot of heat.

2.2 2.2.1 32

2.2.2 Two sets of registers on the CPU allowing for fast context switching OR CPU can preload the next instructions to be processed into the second set of registers while processing the instructions loaded into the first set.

2.3 2.3.1 3600 MHz.

2.3.2 Store the next few instructions and data likely to be processed by the CPU to speed up slower RAM.

2.3.3 There could be latency – where the RAM is slow to respond for a request to fetch data
The data must travel on the motherboard to get from RAM to the CPU. The motherboard could be slower.
Processor cache is on the CPU so there is little delay in obtaining the data.
ANY TWO CORRECT different reasons.

2.4 2.4.1 Multiple hard drives connected to a controller to protect against hard drive failure.

2.4.2 The type of RAID used. Such as mirroring or striping.

2.4.3 Make a copy of data to be stored in a separate location.

2.4.4 RAID protects again hard drive failure. If RAID controller fails a backup is still needed.
OR Backup copies data and is dependent on when the backup was last made. It does not solve hardware failure.

2.4.5 SATA is slower than PCIe.
It takes time to write the data across multiple drives and calculate parity
Mechanical hard drives are slower to access data.

2.5 2.5.1 Store the program to boot up/initialise the computer OR Run POST

2.5.2 BIOS

2.5.3 System settings/User Settings/Location of OS

SECTION C NETWORKING

QUESTION 3

3.1 3.1.1 Choose the best path between networks and connect network of different architectures OR connect to the Internet.
ANY TWO

3.1.2 The desktop and printer are connected to the router with USB cables.

3.2 3.2.1 Unique address of the network card OR device.

3.2.2 DHCP / Dynamic Host Configuration Protocol

3.2.3 ARP/ Address Resolution Protocol

3.2.4 (a) 256

(b) 8 bits for last number = 2^8 = 256

3.3 3.3.1 Frame

3.3.2 Dest IP (Printer) – 192.168.0.5
Dest MAC (Router) – 00:25:96:12:34:56

QUESTION 4

4.1 4.1.1 Code that runs on the remote server before the web page is delivered to the user.

4.1.2 Code to input the user's word and compare to the given word does not need to access the remote server.

4.1.3 The Wordle site records a computer's IP address
The cookies are different for each device.

4.2 4.2.1 Protocol to safeguard the connection to a web site.
OR protocol to ensure safe sharing of data.
ANY TWO – must say that it is a protocol.

4.2.2 So that data transferred is encrypted.
OR Hackers cannot access a user's guesses
OR Modern browsers give security warnings when connecting to insecure sites.
ANY TWO

4.3 4.3.1 NO

4.3.2 Dark web requires onion routing software OR any valid software to access the dark web
Search engines will return results for the Wordle game.
Dark web used for illegal activity – Wordle is not illegal.
ANY TWO

4.4 4.4.1 A VPN connects a remote user to a private network using the Internet.
OR A VPN hides a user's IP address when connecting to the Internet.
Answer MUST say the Internet.

4.4.2 YES or NO
Do not award marks if there is no correct reason in 4.4.3

4.4.3 The IP address has changed so it looks like a new user.
OR The VPN could have cleared the user's cookies.
ANY CORRECT ANSWER.
Do NOT award marks if reasons contradict Question 4.4.1.
Only allocate a mark here if the reason is justified in Question 4.4.2.

4.4.4 Remote access – user takes control of a remote computer using software
VPN – user joins a network but cannot access a computer's resources.

SECTION D SOCIAL IMPLICATIONS

QUESTION 5

5.1 5.1.1 YES or NO

5.1.2 If YES – the intellectual property belongs to New York Times
OR The game could be copyrighted
ANY CORRECT ANSWER

If NO – Xavier has developed his own code and it is an adaption.
OR – If the game is not copyrighted it is OK
ANY CORRECT ANSWER

5.2 5.2.1 Information overload is when a user in unable to process/deal with a large volume of data/information.

5.2.2 Block or unfollow Twitter Users
Restrict the time spent on Twitter (can be done with an app)
ANY CORRECT ANSWER

5.2.3 It can be considered cyber-bullying
It violates the intention of another online app
It is an automated bot
It was reported by users
It is a spam account
ANY CORRECT ANSWER

5.3 English teachers can use it to teach students vocabulary
LO/Maths teachers can use it to teach logic/problem solving
Gamify spelling by creating competition
ANY CORRECT ANSWER

5.4 5.4.1 Add in tool tips for each block
Add in voice description for the blocks
Use different shape blocks
Change the font of the blocks
ANY CORRECT TWO

SECTION E DATA AND INFORMATION MANAGEMENT AND SOLUTION DEVELOPMENT

QUESTION 6

6.1 The totalDays must be incremented each time an object is instantiated.
OR – totalDays must keep its value for each new object.
Only award ONE mark if they say "belongs to the class".

6.2 The field totalDays must not be accessible from class users since the value can be changed and will be incorrect.
OR The field totalDays is not used as a constant, so by the principle of information hiding it should be private.

6.3

UserWordle
Fields: - IPaddress: string - startTime : DateTime - endTime : Time - numAttempts : integer - <u>totalDays : integer</u>
Methods: + Constructor (inIP : string, inS : DateTime, inE : Time, inNA : integer) + getIPAddress () : string <u>+ getTotalDays () : integer</u> + setStartTime(inST : DateTime) + setEndTime (inE : Time) + toString () : string

- ONE mark for IPAddress, startTime, endTime, numAttempts fields
- ONE mark for correct types
- ONE mark for type private
- TWO marks for totalDays field private and underlined (static)
- ONE mark for correct constructor
- ONE mark for getIPAddress
- ONE mark for static getTotalDays
- ONE marks for mutators methods
- ONE mark for correct toString

6.3.1 It will be incremented in the constructor.

6.4
```
{
   "IPAddress": "123.234.54.6",
   "startTime":"24-06-2023 13:12:34",
   "endTime":"14:02:32"
   "numAttempts":6
}
```
- ONE mark for opening and closing curly brackets
- ONE mark for field names in quotes
- ONE mark for correct field names
- ONE mark for correct values
- ONE mark for the value pairs
- ONE mark for numAttempts value not in quotes

6.4.1 Used by many applications OR easy to understand OR can be used in a NoSQL database.
ANY ONE

APPENDIX A

QUESTION 7

7.1

Line No	userWord	word	i	i <=num letters -1?	lett	pos	pos == i?	pos >= 0?	correctLett	wrongPlace	notInWord
	ship	happy									
1			0	T							
2					's'						
3						-1					
4							F				
6								F			
8											s
1			1	T							
2					'h'						
3						0					
4							F				
6								T			
7										h	
1			2	T							
2					'i'						
3						-1					
4							F				
6								F			
8											si
1			3	T							
2					'p'						
3						2					
4							F				
6								T			
7										hp	

- ONE mark for values of i
- ONE mark condition i <size-1? related to i
- ONE mark for extracting the character in lett

- ONE mark for correct values of pos
- ONE mark for pos == i?
- ONE mark for pos >= 0?
- THREE marks for correct values for correctLett, wrongPlace and notInWord

7.2 Since 'Happy' has 2 'p's the search finds the first p in the word even though the 'p' in 'ship' is in the correct place OR the temp variable has no value to return.

QUESTION 8

8.1 8.1.1 The value of the field only stores a single data item.

8.1.2 It is single point in time

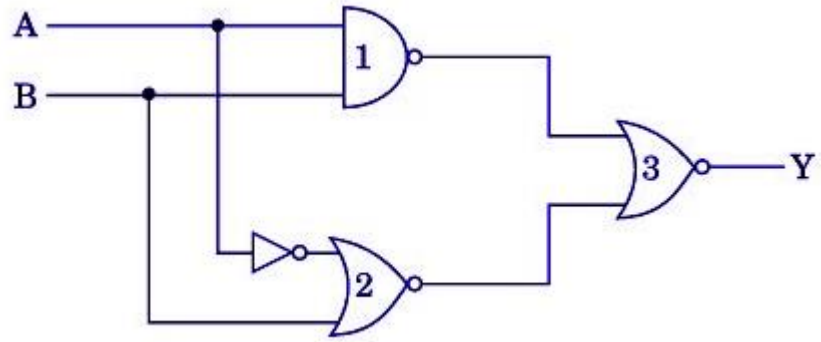
8.1.3 The date belongs to Wordle and the time belongs to the user.

8.2 User (IPAddress, StartingFontSize)
Wordle (Date, Word, DailyTotalUsers)
DailyWord (IPAddress, Date, NumAttempts, StartTime, EndTime)

SECTION F DATA REPRESENTATION LOGIC GATES AND BOOLEAN ALGEBRA

QUESTION 9

9.1



- TWO marks showing inputs A and B
- ONE mark for each correct gate = FOUR marks
- Accept 2 gates for NAND (NOT and AND)
- Accept 2 gates for NOR (NOT and OR)

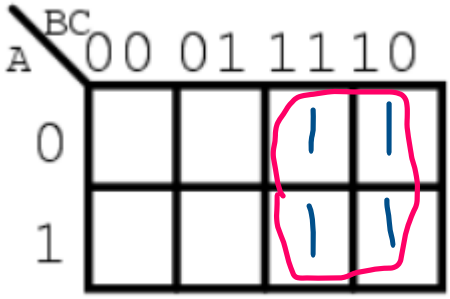
9.2 F(A,B) = ((A.B)' + (A' + B)')'
= A.B. (A' + B)
= A'.A.B + B.AB
= AB

9.3

A	B	((A.B)' + (A' + B)')' WORKINGS	((A.B)' + (A' + B)')'	AB
0	0	((0.0)' + (0' + 0)')' = (0' + (1 + 0)')' =(1 + 1')'= (1+0)' =1'	0	0
0	1	((0.1)' + (0' + 1)')' = (0' + (1 + 1)')' =(1 + 1')'= (1+0)' = 1'	0	0
1	0	((1.0)' + (1' + 0)')' = (0' + (0 + 0)')' =(1 + 0')'= (1+1)' = 1'	0	0
1	1	((1.1)' + (1' + 1)')' = (1' + (0 + 1)')' =(0 + 1')'= (0+0)' = 0'	1	1

- TWO marks for correct substitutions
- ONE mark for each correct calculation × 4

9.4



F(A,B,C,D) = B
TWO marks for correctly placing variables of the map.
TWO marks for the group

Total: 150 marks