



NATIONAL SENIOR CERTIFICATE EXAMINATION
NOVEMBER 2020

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 Modular design
- 1.2 Phishing (Accept: email Spoofing, NOT spoofing)
- 1.3 Video on demand (VoD) Accept: Streaming/Stream; AVOD
- 1.4 UDP
- 1.5 Botnet/Zombie army (Accept: swarm)
- 1.6 Tablet/Phablet (Accept: iPad or similar product names)
- 1.7 Gateway
- 1.8 Back door (Accept: Hacking; cracking)
- 1.9 Wireless mesh (Accept: Mesh Network; Hybrid)
- 1.10 Social media (Accept: Social Networking)

QUESTION 2 MATCHING COLUMNS

- 2.1 D
- 2.2 G
- 2.3 L
- 2.4 I
- 2.5 O
- 2.6 C
- 2.7 E
- 2.8 J
- 2.9 A
- 2.10 P

SECTION B SYSTEM TECHNOLOGIES

QUESTION 3 THEORY

- 3.1 C
- 3.2 D
- 3.3 A
- 3.4 D
- 3.5 B
- 3.6 C
- 3.7 B
- 3.8 A
- 3.9 A
- 3.10 C

QUESTION 4 APPLICATION

4.1 RAM is a form of volatile primary storage. Accept: non-permanent, temporary

ROM is non-volatile, primary storage. Accept: permanent

4.2 RAM will contain data and applications that are currently being used by the device.

ROM will contain the operating system and other software the device needs in order to operate. Accept: certain applications that are standard on the device might also be stored here.

4.3 4.3.1 RAM / ROM (Must justify in 4.3.2)

4.3.2	RAM Volatile or temporary Not refreshed Data can be changed Short term Can read and write to it	ROM Non-volatile/permanent Not refreshed Additional software on ROM chips Long term Can only read from it Can be changed electronically SD can be flashed Can save apps
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Accept any two correct reasons

4.3.3 Example 1: Photos
 Example 2: Documents
 Accept any TWO correct answers.

4.4 4.4.1 Pixel – picture element – a small area of illumination on a display device, the smallest unit of a display. Accept: small diode of light, cluster of coloured light squares.

4.4.2 The video/graphics card, the screen itself, density of pixels. Accept screen size, PPI, Windows 10 update will affect resolution.
 Any ONE correct factor.

4.4.3 (a)

$R1 \leftarrow$ horizontal resolution
 $R2 \leftarrow$ vertical resolution
 $S \leftarrow$ size of screen
 $\text{Step1} \leftarrow R1^2 + R2^2$ calculation; squares of values
 $\text{Step2} \leftarrow \sqrt{\text{Step1}}$
 $\text{PPI} \leftarrow \text{Step2} / S$

Accept alternative solutions that are correct, for example:

- Allow values for R1, R2 and S to be input rather than just assigned: provided the correct values are entered to the correct variables – assign the marks accordingly. If specific values are assigned, minus 1 mark
- If candidates show a program rather than an algorithm, minus two marks no additional penalisation
- If assignment statement uses "=" instead of \leftarrow , penalise once.
- Calculation steps could be combined: provided the steps are correct and all correct values have been used – allocate the marks.
- Alternative: raised to the power of 0.5 – accept.

(b)
$$\frac{\sqrt{(C + G)}}{F}$$

4.5 4.5.1 No/Yes

4.5.2 Justification must match answer in Question 4.5.1: If no justification, then no mark for Question 4.5.1

No: The device is not being used primarily for photography; the work the delivery agent is doing doesn't involve taking high resolution photos, not necessary for high resolution profile pictures, would become more expensive and unnecessary for the job if high-res camera included

Yes: Delivery agents might want to use the phone to take photos of what they are delivering for reference, e.g. the address of the item so they can see it while they are driving; take photos if they should be involved in an accident.

4.6 The delivery agents are probably going to be working fairly long hours, will be away from charging points, don't want to have to stop delivering (and therefore not earn money) to recharge their devices, apps become resource hungry when used continuously, device will be on all the time to check notifications. Accept TWO correct options, but must be related to the scenario. FOCUS should be on: hours of the day, access to a charger, app usage for mark allocation.

4.7	Characteristic	Android	iOS
	Open Source	✓	
	Proprietary		✓
	Free with device	✓	✓

4.8 Different operating system, different processor (different instruction set), apps are sold in different online stores. Accept any ONE correct answer. Do not accept different versions of RAM as an answer.

4.9 4.9.1 A computing storage model where data is stored on servers generally accessed via the Internet.

- 4.9.2
- connection to the Internet
 - service provider/pay as you go
 - application to access the service
 - mobile data or Wi-Fi access
 - bandwidth considerations – must be explained
 - free or paid-for service providing storage
 - registered with Gmail/O365/Mobile Me service/active
 - available space on the service/device linked to cloud storage
- Accept any THREE correct answers.
Do not accept battery life here.

SECTION C INTERNET AND COMMUNICATION TECHNOLOGIES**QUESTION 5 THEORY**

5.1 5.1.1 Switch

5.1.2 They both connect network nodes into a network, OR used in a star topology. Accept: Connects devices together – imply connection for a network, transfer data across a network.

5.1.3 A hub broadcasts to all nodes, and switch transmits to a single node, switch is point to point.

Fewer (no) collisions in point to point transfer.

A switch can learn and store MAC addresses of nodes, uses a table, uses ARP.

Data is transmitted as a pure electrical signal (bits) in a hub, but as frames or frames and packets on a switch.

Hubs operate at layer 1, switches on layer 2 or 3 (for candidates who understand OSI).

If candidate mentions just IP address on its own in a reason, don't accept; if IP and MAC address are mentioned, accept. Also, if candidate implies concepts of half/full duplex – allocation marks. Do not accept: Speed/goes faster

Accept any TWO correct options.

5.2 5.2.1 Any node can print to the network printer.

5.2.2 (a) IPv4

(b) Similarity: Both form part of the internet protocol; both connectionless, both use packet switching; both used to identify devices on a network, both given by DHCP

Difference: IPv4 – numeric, IPv6 – alphanumeric,

IPv4 = 32 bit,

IPv6 = 128 bit, more available addresses

(c) IPv4 addresses running out, insufficient because of only using 32 bits, limited number, IPv6 offers more options. Accept any TWO correct answers.

5.2.3 Connect to server and share, connect via Bluetooth if available on the printer, connect via Wi-Fi AP if printer has Wi-Fi. The printer will still be connected to a network device, and therefore will be accessible to all devices across the network.

5.3 5.3.1 To allow devices to connect wirelessly to a network. DO NOT accept: gives access to the Internet.

5.3.2 Yes

5.3.3 It needs an IP address so that traffic can be routed to the device correctly, so that it is identifiable to the network, using the same protocol. Accept: If you are connecting to a website/webpages, you would need an IP address.

- 5.4 Backup physically takes data from one device and stores it onto another. RAID replicates data from one area to another. Both protect data, RAID cannot operate remotely, backup can. RAID can fail, you still need a backup.
 Accept for backup: If one version fails, we can overwrite by bringing a copy back.
 For RAID: If candidate is only looking at mirroring, only one mark – unless they use this as reason for difference or spoke about the FAILURE of a drive, then second mark allocated.

QUESTION 6 APPLICATION

- 6.1 6.1.1 To ensure only Pizza World customers use the Wi-Fi, to limit the number of people using the Wi-Fi at any one time. Accept any TWO valid answers.
- 6.1.2 (a) Secured means that data transmissions to and from the AP are private/restricted/not open.
- (b) WEP, WPA, WPA2. Do not accept WPS (not encryption), SSL, HTTPS accepted.
- (c) Yes: Malware could be injected/planted onto their device while they are doing their banking; didn't use a VPN on a public network.
 No: WPA/WPA2 (if SSL/HTTPS mentioned in (b) above and this is justified here in (c), accept. These provides strong enough encryption. If protocol wrong (e.g. TCP) but explained keys/encryption, then accept and allocate marks.
- (d) No
- (e) Public network – users must take responsibility, users should never do banking on such a network, Pizza World is not acting as an ISP, malware could already exist on the customer's device, It is not their responsibility, it is a public network and users shouldn't expect that level of security on such a network, it is a free service.
 Accept any TWO valid answers.
- (f) Pizza World could display a non-liability notice in the store, wording on the username/password sheet they are given, "splash page" when logging into the Wi-Fi explaining t's & c's, link to an AUP, block all HTTPS traffic, install a firewall. Firewall (one word answer on its own) not acceptable; use expert to test for vulnerabilities, block specific URLs.
 Any TWO correct answers.

6.2 6.2.1 (a) and (b) Phone calls, SMS, MMS, data networking, caller ID. Accept valid answers for (a), must have valid alternatives for options for part (b). Three options shown here:

A	B
Phone calls	Skype calling (can call any number with subscription), WhatsApp voice calling (or similar) if contact is using the service.
SMS	Message via WhatsApp, iMessage or similar.
Internet connections via cellular data	Use public Wi-Fi for any Internet connections.
USSD code	Use service provider's app for similar services
Connect to mobile network itself	Connect to a Wi-Fi network

If all items in Column A are wrong – don't relate to GSM features, accept correct options in Column B, maximum of 2 marks.

- 6.2.2 (a) GPS is a system of satellite-based navigation providing location and time information. Candidate does not have to mention location and time – one is sufficient.
- (b) Mapping software, accept Google Maps, Apple Maps. Do not accept tracking.

6.3 6.3.1 Location based services (LBS)

6.3.2 Complement: Business which offer complimentary services, e.g., drinks, transport, food other than pizzas, newsagents. Accept anything to do with fast foods, but not specific products or chain names – must be a type of business.

Compete: Any other pizza business, businesses which are open at different hours to Pizza World. Any fast-food place would compete – accept this, do not accept actual brand names

SECTION D SOCIAL IMPLICATIONS

QUESTION 7

- 7.1 To ensure users are not subjected to bad content, to avoid any legal liability; Terms and Conditions, safe platform, fake news, cyberbullying
Accept any TWO valid options.
- 7.2 Violent content, pornography, racist content, hate speech. Accept any TWO valid options; GORE; NOT adverts.

Do not accept duplication of answers in 7.1 and 7.2: mark once only.

- 7.3 A user can easily disable this option (toggle switch), relies on what Google decides is undesirable content; this isn't exact filtering; lots of content may be added.
- 7.4 To avoid being sued by an employee if they are negatively affected by the content they view all day.
To not have to pay for any medical bills of employees who need therapy;
Accept items relating to consent
Do not accept AUP.
- 7.5 No – this does not seem right; I am being asked to sign a form that passes all liability away from the company, but they cannot even provide a proper service to assist me.
Yes – I would not want non-professionals providing a diagnosis.

NB: All or nothing with the Yes/No: if reasons don't match to the Yes/No, no mark for that.

Important that this relates to the STAFF EMPLOYED.

7.6

Efficiency	Effectiveness
A smart algorithm, or AI system, would be more efficient, would work quicker, can work 24/7, doesn't need to worry about people being affected. 1 mark per factor which suggests better efficiency	May not always be as effective: the algorithm might be tricked by certain images or content, users will learn how to bypass it, will need to have manual checks, need to be updated, algorithm will only detect what it is trained to, might have false positives. 1 mark per factor that suggests lower effectiveness.

Do not double mark duplication. Effectiveness reason must show understanding. Efficiency is all around SPEED of moderation

- 7.7 Ensure secure access to the update process, only allow limited people access to do updates to app, secure incoming connections to the server where the app works from; Firewall; Port blocking. Second mark: must relate to the scenario; accept if candidate mentions the app as reference to scenario.

SECTION E DATA AND INFORMATION MANAGEMENT AND SOLUTION DEVELOPMENT

QUESTION 8

8.1 8.1.1 All the OnTime fields would have been set to Yes by the first query.

8.1.2 No – will just invert the position.

8.1.3 Restore a backup of the database, use an audit trail to see which records were changed and reverse these manually. Accept any other correct options.

8.1.4 Method 1: Write a better query using more than one field to decide which to change. Accept: update orders to set OnTime to NOT(OnTime)

Method 2: Write a query to remove the current yes-related records to a new table, change them, change the other fields, then merge back into the table.

8.2 8.2.1

UPDATE	
DELETE	
INSERT	✓

8.2.2 Because there is a primary key violation – the field AgentName is a key field and it does not have a value, therefore the record cannot be added.

8.3 8.3.1 It will provide the manager with a list of delivery agents who deliver pizzas from his outlet on time. Will help him know which agents are more reliable than others. Accept any other correct options.

8.3.2

Agent	OnTime
Hermione	4
Fazul	1
Thabo	2

If candidate assumes that 8.1.1 query has been applied, accept the following:

Agent	OnTime
Jia-Hai	2
Jimmy	1
Thabo	

8.3.3 (a) HAVING allows a condition to be placed on the output of a query that has made use of a GROUP BY – WHERE clause cannot be used; applies to a field or a record.

(b) Fazul's record will be removed from the result set.

8.4 8.4.1 Redundant data is the same piece of data held or saved in two different places. Unnecessary duplication is important.

8.4.2 Field 1: CustName Field 2: PizzaType
Accept: AgentName, AgentPhone

8.5 Orders (OrderID, CustName, PizzaType, AgentName, AgentPhone, OnTime)
 Mark allocation: for relation name, for all fields correctly named, for two keys underlined.

8.6 8.6.1

Field	Dependent on
CustName PizzaType	OrderID
AgentPhone	AgentName

Accept any one correct field for each key.

8.6.2 Orders (OrderID, CustName, PizzaType)
 Agents (AgentName, AgentPhone,)
 AgentOrders(OrderID, AgentName, OnTime)
 Mark Allocation: 2 new relations with applicable names, for all fields correct in each relation, for keys correct.

QUESTION 9

9.1

<p>ORDER</p> <p>Fields</p> <ul style="list-style-type: none"> - orderNumber : integer - customerName : string - pizzaOrder : array [10] Pizza - deliveryAgent : Agent <p>for all private(-) for orderNumber and customerNumber correct and typed for pizzaOrder shown correctly as array of Pizza objects for deliveryAgent shown as type agent</p> <p>Methods</p> <ul style="list-style-type: none"> + Constructor (oN:integer, cN:string, pO:[] pizza, dA:agent) + getOrderNumber() : integer + getDeliveryAgent() : Agent + setPizzaOrder (pO : [] Pizza) + setDeliveryAgent (dA : Agent) + toString() : string <p>for constructor with all parameters of constructor correct names and types for accessor methods correct for mutator methods with correct parameters for correct name and type for toString()</p>
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Penalise ONCE for incorrect items: order of name/type.

9.2 Char allows a greater set of values to allow for LGBTQI values, default value for a Boolean is FALSE, so all agents will be male by default. Accept any other valid answers.

9.3 9.3.1

Array Index	[0]	[1]	[2]	[3]	[4]		
agentName	Hermione	Fazul	Jimmy	Thabo	Jia-Hai		
agentGender	F	M	T	M	M		
Line	name	i	pos	flag	i < size AND flag = false ?	name = (agentName [i]) ?	Output
	Jimmy	0	0	false			
1					T		
2						F	
4		1					
5			1				
1					T		
2						F	
4		2					
5			2				
1					T		
2						T	
3				true			
4		3					
5			3				
1					F		
6							Jimmy M

Marking allocation:

for all correct values of i;

for all correct values of pos;

NB: allow 1 mark if the candidate's values for i and pos are incorrect but show a pattern/follow logically

for flag shown as TRUE at line 3

for three values of TRUE (i < size) and for two values of FALSE (name = nameArr[i])

for FALSE (i < size) (against line 1)

for TRUE value (name = nameArr[i]) (against line 2)

for two correct return values. Allow 1 mark if the wrong name is returned, but corresponding gender is correct; vice versa.

9.3.2 (a) Line 5

Can also be Line 4 or 6 but reason(s) must be correct

(b) Check reason from (a) above – must relate to line chosen.

Line 5: swap with line 4 or more line 5 to be inside the IF statement or decrement pos by 1 after the while loop

Line 4: Make the i++ part of an else statement ...

Line 6: Move the display statement into the If ... statement or display using pos-1 (line stays in the same position)

(c) An array of objects.

Total: 180 marks