



NATIONAL SENIOR CERTIFICATE EXAMINATION  
NOVEMBER 2019

**INFORMATION TECHNOLOGY: PAPER I**  
**MARKING GUIDELINES**

Time: 3 hours

180 marks

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**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.**

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**SECTION A            SHORT QUESTIONS****QUESTION 1            DEFINITIONS**

- 1.1    Firmware/BIOS Accept embedded operating system/mobile operating system
- 1.2    Defragmentation Accept defragment/defragmenting
- 1.3    Virtual Private Network (VPN)
- 1.4    Plug in /RIA Accept extension/add-on
- 1.5    Cookie
- 1.6    Blackfish / MySQL/Postgre/JavDB NOT ACCESS
- 1.7    Semantic search NOT SEO
- 1.8    Public key Asymmetric key
- 1.9    Interrupt
- 1.10   Hot swapping / hot plugging

**QUESTION 2            MATCHING COLUMNS**

- 2.1    D
- 2.2    H
- 2.3    K
- 2.4    L
- 2.5    C
- 2.6    E
- 2.7    I
- 2.8    M
- 2.9    A
- 2.10   B

**SECTION B            SYSTEM TECHNOLOGIES****QUESTION 3**

- 3.1    AMD, Qualcomm, NVIDIA, IBM, Samsung, Motorola, HP, ARM, Hauwei  
Accept any correct name
- 3.2    The hardware in a computing device where the operating system (OS), application programs and data in current use are stored. for mentioning OS, applications or data; for current use. OR A component that stores currently loaded programs and data. Don't accept just "instructions"
- 3.3    3.3.1 High  
3.3.2 Graphics card
- 3.4    3.4.1 The clinic will need to be able to run the laptops all day as the clinics are mobile and might not have access to a regular power supply. If there is a power supply, they might be affected by load shedding. If they chose the standard battery they would have to be assured of a power supply or take a UPS or other backup battery pack with them. Other options to accept: length of working day, power outages (similar to load shedding), battery charges faster, higher res screen drains battery faster Looking for: Unreliable power supply, availability of power, length of day: these are the critical factors for TWO correct facts

- 3.4.2 (a) The process of increasing the clock speed/rate of a component resulting in the component running faster than it was designed to run. OR increase the clock multiplication factor of a component OR increase the system bus speed hence increasing all components
- (b) The CPU would use more power as it is working at a faster rate; there would be a need for more cooling for the CPU which will also use more power for TWO correct facts. Don't accept just "component will fail."
- 3.4.3 Because an SSD has no moving parts; less heat is generated by an SSD therefore less cooling is needed. Accept start-up efficiency in various forms; data transfer takes place faster, use for less time for TWO correct reasons
- 3.5 3.5.1 Type of RAM: SRAM or Static RAM
- Characteristic: Faster than normal DRAM; doesn't need to be refreshed. Accept differentiation of component of SRAM vs DRAM
- 3.5.2 A processor cache only stores very small amounts of data at one time in the form of the next instructions the CPU is likely to need whereas RAM has to store larger amounts of data for the operating system, applications etc. A 3MB cache is quite adequate for what is to be stored there because instructions used by the CPU are each very small.
- 3.6 3.6.1
- Controlling hardware and software resources
  - Loading and running application programs
  - Providing a user interface
- 3.6.2 Choose from: Windows, Linux, and other valid operating system for a laptop. Accept MacOS. Ubuntu: stripped-down version, uses less power
- Justification must match the operating system, e.g.: Windows: well known – used by lots of people; good support. Linux: free; open source so can be modified for organisation's needs
- Ref to scenario would boost Windows option: People working there are most likely to have encountered Windows as an OS.
- 3.7 3.7.1 There could be business-related classified information on the laptop; there are confidential medical records of patients on the laptop.
- 3.7.2 (a) A data/file encryption technique that uses a 256-bit key to encrypt and decrypt data or files. Accept an explanation which uses  $2^{256}$  combinations/alternatives. Don't accept re-wording of question.

- (b) Yes/No: Justification must be relevant.

Will be difficult to accept NO for this question: 256 bit is one of the strongest forms of encryption which will take a long time to break should data be stolen. Accept if candidate suggests a stronger form of encryption, e.g. 512-bit key.

Marking: one mark for Yes/No, one mark for reason. **If no reason, no mark for just Yes/No.** If reason doesn't match Yes/No, no mark for reason

- 3.8 3.8.1 Name; address; medical condition; medical history; date of previous appointment; previous medication prescribed. Accept other valid data items relating to the patient.
- 3.8.2 (a) Paper can easily be misplaced; Data on paper can be more easily shared; there is no way to trace who has read a piece of paper. Accept: Anything to do with physical damage to the paper, paper can't be encrypted/password protected, social engineering, accessibility.
- (b) Ensure that the pieces of paper are kept securely in the clinic and destroyed once the data has been captured into the system at the offices. **MUST REFER TO NON-DIGITAL DATA.** What about concepts like RocketBook? Accept anything to do with secure storage/checking access, organised filing system, protection from the elements. **DO NOT** accept scanning and make a back-up, backing up etc.
- 3.9 3.9.1 Not possible – constrained by the physical size of the laptop. Accept external monitor
- 3.9.2 Possible – depending on free RAM slots. Must refer to slots. Accept if candidate refers to RAM that is soldered to motherboard – can't be changed, modularity, replacing/upgrading (DDR3->DDR4)

**SECTION C INTERNET AND COMMUNICATION TECHNOLOGIES**

**QUESTION 4 THEORY**

4.1 Switch (Only answer – NOT router, hub)

4.2 4.2.1 Firewall: The purpose of a firewall is to control what traffic is allowed to traverse from one side of a **network** to the other, i.e. from the external side of the **network** to the internal side. Important parts are: un-authorized access, controlling traffic, preventing threats, blocking ports. Not **only** threats. Must mention network for second mark.

4.2.2 Web cache: A web cache is a temporary storage (caching) of web documents, such as HTML pages and images, to reduce response time.

4.2.3

Threat	Yes / No	Reason
URL blocking	Yes	Firewall is able to inspect the URL of every incoming webpage.
Hardware theft	No	Firewall cannot prevent someone from physically picking up a piece of hardware.
Denial of service attack	Yes/No	Firewall can be set to detect suspiciously large volumes of traffic which could cause a DOS attack and raise an alert.

4.2.4 Similarity: both keep copies of web document; both assist with speeding up access.

Difference: web cache is network-wide; disk cache is local to a machine.

4.3 4.3.1 Advantages: Easy to set up and maintain; one connection failing doesn't affect the rest of the network; easy to diagnose problems; easy to extend.

Disadvantages: Switches can be expensive; switch is a single point of failure; lots of cabling required.

4.3.2 Advantages: Cheap; cost effective; easy to install and maintain; commonly used so lots of support.

Disadvantages: Easy to eavesdrop; only supports short distances and slower speeds (must compare to fibre) (but can get over 1 GBs now!); EMI interference; crosstalk.

4.4 4.4.1 A virtualisation technique that involves partitioning a physical server into a number of small, virtual servers with the help of virtualisation software. One physical server with multiple instances. Also accept multiple software instances.

4.4.2 Advantage: Fewer physical servers required; saves space in server room. Any correct advantage with explanation. Accept multiple OS's running on 1 server, cost reduction, eco-friendly/energy saving, reduction of carbon footprint, maintenance reduced.

Disadvantage: Higher spec server required, might cost more to begin with; if the one physical server fails, all virtual servers fail. Any correct disadvantage with explanation. Accept: Security risk – if you hack into the one physical server, you have access to all VMs, scalability issues/performance, but these must be specific to resources! Need expertise to maintain the server and VMs.

**QUESTION 5 APPLICATION**

5.1 5.1.1 Large amounts of (video) traffic are being generated by the items connected to B which is being fed to C where the traffic from A is also going; connection from B to C is UTP which is slower than fibre and might be saturated with video traffic. Any two valid reasons why. Accept: bad network design; bottleneck, bandwidth of UTP, switch mis-configuration, malfunctioning network card; attenuation over distance. "A lot of devices on the network" is NOT acceptable – it is about traffic from the devices.

5.1.2 Speed up the connection medium between B and C; change position of B and C on the network; further segment the network with another switch; use a bridge to connect the segments. Any two valid ways with justifications to change the design in such a way that speed is improved. Accept: upgrade cable but must explain fibre; move CCTV server to B but not in conjunction with moving the switches; upgrade backbone. NOT: cable link from switch A to C.

5.2 5.2.1 Loss of power meaning LASER cannot transmit down the fibre; failure of media converters anywhere along the route; cable damage. Accept any correct answer. Accept: Theft of cable

5.2.2 WiMAX; Satellite; Microwave. These are ideal answers. Accept WiFi, 3G/4G/5G, ADSL, LTE, VDLS, Broadband

5.3

5.3.1	To provide access to resources within the organisation	Only employees at work
5.3.2	Access to public/ global network	Anyone
5.3.3	Access to resources between branch offices or allow the public access to some of their resources	Employees + <b>controlled access</b> by public

Marking: one for each definition, one for each of the use and users of each item.

5.4 5.4.1 health; clinic; health clinic, mobile clinic Any TWO valid keywords which show that the candidate understands the purpose of keywords and they relate to the scenario, i.e. things that people will probably search for on a medical website. Word mobile on its own, not acceptable

5.4.2 The search terms people use often change over time; you might have new products/services on your website which you want users to see; search engines change the algorithms they use for searching/ranking websites.

5.4.3 (a) Mobile Reason must back up the choice.

Mobile: more people are using mobile devices for searching, it is a convenient device to use, have it with them all the time, "always on"; possible spelling errors; abbreviated word/spelling; LBS; #tagging more likely on mobile devices

Marking: for Yes/No. for justification. If just answer Yes/No with no justification, no mark for the Yes/No.

(b) People use different search terms when using different platforms. E.g.: on a desktop they might search for "health clinics Johannesburg" but on a mobile device they might search for "where is the closest health clinic". Mobile devices may have abbreviations or possible spelling errors due to limited keyboard size, or autocorrect failures! Accepted older/younger userbase for one mark. Desktop more likely to be doing research, mobile for immediate needs. Two reasons shown by candidate.

5.4.4 Yes (unlikely to get a No answer here!)

Voice searches are more likely to be longer strings/sentences rather than individual words, so you will have to cater for this in your keyword lists.

No – justification might be something like the software used for voice searches will break the voice query down into individual words for you. Will use the same spoken keyword that they would have typed. Have to link the two, otherwise not accepted. VERY specific.

Marking: for Yes/No. for justification. If just answer Yes/No with no justification, no mark for the Yes/No.

**SECTION D SOCIAL IMPLICATIONS**

**QUESTION 6**

- 6.1 Email; social media; blogs; online newspapers. Any two valid digital technologies.
- 6.2 6.2.1 Published by a well-known medical journal; an actual doctor was involved with the research; results showed a correlation between vaccinations and autism. Accept links to other studies.
- 6.2.2 There were only 12 subjects in the research – this is a small sample compared to millions who receive the vaccine; the doctor paid for kids to donate blood – this sounds totally like a fake story! Only one doctor involved with the study.
- 6.3 6.3.1 No (unless the patient has given consent) Accept "Yes" only if the candidate refers to the de-identification of the data.
- 6.3.2 Confidential medical data may not be given away to anyone without the consent of the patient.
- 6.4 Acceptable Usage Policy (AUP) Accept Privacy Policy, POPIA
- 6.5

	<b>Method</b>	<b>Community</b>	<b>Justification</b>
1	Digital noticeboards at the mobile clinic	Urban/Rural	People coming to the clinic can see notices/videos telling them the facts.
2	Printed posters/ leaflets	Urban	Distribute these to people in the community explaining in simple terms what the facts are.
3	Text messages	Urban/Rural	A lot of people in rural communities have access to simple mobile phones with text message ability.
4	Podcasts	Urban	These can be played while the mobile clinic drives around the rural areas for people to listen to; downloaded by people in urban areas to listen to on a mobile device.
5	Social Media sites	Urban	Write articles by the doctors who they see each week and who they trust.

Marking: one for each valid method shown, one for the justification. The community and justification columns must be marked together. Accept any valid method: refer back to scenario which states that rural community don't like tech; however, some members of the community MIGHT be using technology – scenario doesn't say it is banned in the area.

- 6.6 6.6.1 Distributed processing. Accept grid computing, NOT cloud computing
- 6.6.2 Astronomy projects; UFO spotting. Valid options where distributed processing is used. Lots of possible examples!

**SECTION E DATA AND INFORMATION MANAGEMENT AND SOLUTION DEVELOPMENT**

**QUESTION 7**

- 7.1 7.1.1 To eliminate repeating groups; to avoid data redundancy; to avoid data anomalies; to make queries simpler.
- 7.1.2 2NF: Relations are in 1NF and there are no partial dependencies  
3NF: Relations are in 2NF and there are no transitive dependencies.  
Don't accept relationship diagrams/lists
- 7.2 7.2.1 A field in a database table which uniquely identifies each record in the table.
- 7.2.2 A key made up of two or more fields. Accept "two fields"
- 7.2.3 PatientID ConsultID ConsultID on its own: one mark. PatientID on its own, no mark.

7.2.4

<b>tblPatients</b>	<b>tblConsultations</b>
PatientID	ConsultID
Surname	Date
FirstNames	Duration
ConsultID	FollowUp

OR

<b>tblPatients</b>	<b>tblConsultations</b>
PatientID	ConsultID
Surname	Date
FirstNames	Duration
	FollowUp
	PatientID

Marking: for correct Primary Keys  
for fields correct in each table  
Foreign Key: ConsultID (Accept PatientID if it is shown in tblConsultations)

- 7.2.5 A field in a table which is the primary key in another table.

**QUESTION 8**

8.1 Only the Patient class

8.2 8.2.1 Neither: Because the two methods have the same name but are in unrelated classes. Have to mention "same name" as well as "different classes" for the second and third marks. If candidate gives "Neither" but incorrect explanation, one mark only. If candidate gives "Method overloading" or "Method overriding" (both wrong) but has correct explanation.

8.2.2

<b>PATIENT</b>
<p>Fields</p> <ul style="list-style-type: none"> <li>- patientID : integer</li> <li>- surname : string</li> <li>- firstName : string</li> <li>- patientAge : integer</li> <li>- medication : array [20] string</li> <li>- clinicName : string</li> <li>- followUp : integer : Accept string (contradiction in question)</li> </ul> <p>for all private(-) for all fields and all types correct</p>
<p>Methods</p> <ul style="list-style-type: none"> <li>+ constructor (p:integer, s:string, fN:string, a:integer, m:[] string, c:string, f:string Accept integer (Contradiction in question))</li> <li>+ getClinicName : string</li> <li>+ setClinicName (cn : string)</li> <li>+ toString : string</li> </ul> <p>for all methods public (+) for constructor with all parameters of constructor correct names and types for accessor method for mutator method with correct parameter for correct name and type for toString()</p>

8.2.3 Date of birth will be a better option as you will be able to calculate a patient's age easily. If the age is stored, it will have to change every year.

8.3 8.3.1

K	F	O	R	G	D	C	E	M	B	L	P	U
---	---	---	---	---	---	---	---	---	---	---	---	---

Marking allocation:  
 K must be before the loop  
 F to start the outer loop  
 R must be in the first loop  
 D, C, E correct sort order

B must be after M  
 L to end inner loop  
 P to decrement; between inner and outer loops  
 U to end outer loop

8.3.2 Descending order

8.4 8.4.1

line	size	temp	runningAvg	k	count	runningAvg > 60?	DISPLAY
1	4						
2		0					
3			0				
4					0		
5				0			
6		24					
6					1		
8			24				
9						F	
5				1			
6		60					
7					2		
8			54				
9						F	
5				2			
6		78					
7					3		
8			80				
9						T	
10							Error
5				3			
6		100					
7					4		
8			105				
9						T	
10							Error
11							25

Marking allocation: for all correct values of temp; allow 1 mark if not all values are correct but candidate's values show a pattern/ follow logically  
 for all correct values of runningAvg; allow 1 mark if the candidate's values for runningAvg are correct based on incorrect values for temp  
 for k 2, 3 AND count 2, 3, 4  
 for T (True) in last two line 9s and Error in both line 10s; allow 1 mark if candidate's T/T/Error might be wrong but follow his/her solution  
 for output value in line 11.

8.4.2 Line 8

8.4.3 It is necessary; k cannot be used as the algorithm stands as in the first iteration you will have a division by zero.

**Total: 180 marks**