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SENIOR CERTIFICATE EXAMINATIONS/ NATIONAL SENIOR CERTIFICATE EXAMINATIONS

INFORMATION TECHNOLOGY P2

2023

MARKING GUIDELINES

MARKS: 150

These marking guidelines consist of 18 pages.

SECTION A: SHORT QUESTIONS**QUESTION 1**

1.1	1.1.1	E ✓	Metadata	(1)
	1.1.2	K ✓	Record	(1)
	1.1.3	H ✓	Mbps	(1)
	1.1.4	N ✓	Exception handling	(1)
	1.1.5	A ✓	WWW	(1)
	1.1.6	O ✓	Spam	(1)
	1.1.7	F ✓	Plug-in	(1)
	1.1.8	Q ✓	Parameter	(1)
	1.1.9	C ✓	mp3	(1)
	1.1.10	L ✓	Semantic search	(1)
1.2	1.2.1	C ✓	VPN	(1)
	1.2.2	C ✓	Botnets	(1)
	1.2.3	D ✓	Data mining	(1)
	1.2.4	A ✓✓	Answer: 3	(2)

TOTAL SECTION A: 15

SECTION B: SYSTEMS TECHNOLOGIES**QUESTION 2**

2.1 2.1.1 *The purpose of the CPU:*

Performs calculations and other instructions. ✓

Also accept:

Processing of data

(1)

2.1.2 (a) *Explain what the term multicore refers to:*

A *processor* that has more than one processing unit/core ✓ on a single processor chip. ✓

(2)

2.1.2 (b) *Any ONE processing technique that will allow the full benefit of multicore technology: ✓*

- Multi-processing
- Multi-threading
- Parallel processing technique

(1)

2.1.2 (c) More than one processing core, allows multiple tasks or threads to be processed at the same time ✓ improves the speed at which tasks are completed/done. ✓

Any TWO of the following concepts:

- Due to the use of multiple cores
- Multiple tasks/threads
- Processed simultaneously
- To speeds up the time it takes to complete tasks

(2)

2.1.3 Graphics processor has its own resources/processor/RAM which handles the processing of graphical images/rendering ✓, thus lessening the load on the CPU. ✓

Concepts:

- GPU handles processing of images/rendering
- Lessens the load on the CPU

(2)

- 2.2 2.2.1 Diagonally from one corner to the opposite. ✓ (1)
- 2.2.2 HDMI ✓
- ANY ONE motivation for using HDMI: ✓*
- It allows for faster transfer of data
 - Also carries sound
 - Better image quality
 - Carrying control signals (2)
- 2.3 *Any TWO positive properties of flash disk technology: ✓✓*
- High access speeds /higher read/write speeds
 - No noise
 - Very low heat dissipation
 - No moving parts – more robust
 - Low power use
 - Smaller physical dimensions (2)
- 2.4 *ANY TWO advantages of Wi-fi compared to Bluetooth: ✓✓*
- Wi-Fi has a higher bandwidth/speed
 - The range that a Wi-Fi signal can travel is further than a Bluetooth signal
 - Wider variety of devices can connect
 - Larger number of devices can be connected
 - Wi-Fi has better security (2)
- 2.5 2.5.1 An operating system is system software ✓ which controls/manages all the activities that take place in a computer. ✓
- Concepts:**
- System software
 - Controls/manages activities or processes (2)
- 2.5.2 Proprietary OR open-source ✓
- Any TWO motivations/reason specific to the software selected: ✓✓
- Open-source**
- Source code is available for further development
 - Can be customised with necessary skills
 - Often available for free
- Proprietary**
- Formal support
 - Creators accept greater responsibility for the product
 - Fewer versions/more standardised
 - Improve integration with other software
 - Regular updates and patches
 - Updates and features are released throughout the life cycle (3)

- 2.6 2.6.1 *Any ONE example of what SaaS model entails: ✓*
- Software is not bought, but rented
 - Software is accessed over the internet/cloud
- (1)
- 2.6.2 *Any TWO of the following merits in SaaS: ✓✓*
- Easier to roll out updates and fixes
 - Better control over piracy
 - More control of licensing management
 - More constant income stream
 - Can provide mobile and Web access/Ubiquity
 - Faster deployment time
 - Scalability / different pricing options / different features
- (2)
- 2.7 The antivirus needs to scan files for viruses ✓ before it is executed, adding more tasks that continuously run in background. ✓
- Concepts:**
- Scanning of files before use
 - Taking up resources
- (2)

TOTAL SECTION B: 25

SECTION C: COMMUNICATION AND NETWORK TECHNOLOGIES**QUESTION 3**3.1 3.1.1 (a) *Any ONE function of a switch: ✓*

- Connects the devices
- Regenerates signals
- Directs the traffic between devices in the network (1)

3.1.1 (b) *Wireless access point:*

Sends and receives ✓ radio waves. ✓

OR

Makes connection possible to a network (1) by means of radio waves. (1) (2)

3.1.1 (c) *Router:*

Directing data to its correct destination ✓

OR

Allowing communication between different networks/connecting to the internet (1) (1)

3.1.1 (d) *Any ONE function of a server: ✓*

- Provides resources to clients in a network/ share network resources
- Management of access/security (1)

3.1.2 *Any TWO other types of security measures to safeguard your data on a network: ✓✓*

- Using anti-virus/anti-malware software
- Keeping all your software up to date
- Being aware of current trends in computer crime
- Passwords
- Encryption
- Deploying and managing a network policy
- Control user management/Access control
- Perform regular back-ups
- Intrusion detection
- Using a VPN

Also accept any other suitable examples. (2)

- 3.1.3 *Any TWO possible causes for the decrease in transmission rate on Wi-Fi networks: ✓✓*
- Large number of users connected to AP
 - Electromagnetic interference
 - Distance from the access point
 - Excessive data usage by any connected user
 - Impacted by bad weather (2)
- 3.1.4
- Files are broken up into smaller parts ✓
 - Parts are downloaded from different peers/seeders ✓
 - Parts are recombined to form files ✓
- Alternative concepts:**
- Have the necessary software installed (1)
 - Find/select the relevant torrent file (1)
 - Download from a user that has shared the file/seeders/peer (1) (3)
- 3.1.5 (a) Switch ✓ (1)
- 3.1.5 (b) If the switch malfunctions, the entire network will not function. ✓
OR
Single point of failure (1) (1)
- 3.2 3.2.1 *Difference between a file syncing service and a backup service:*
- Synchronisation is ensuring all devices have the latest copy of files. ✓
- Backup is making an additional copy to be used in case of damage/loss. ✓ (2)
- 3.2.2 *Any TWO disadvantages of using cloud storage: ✓✓*
- You need internet access
 - Data costs
 - Security risk
 - Company could go out of business leading to loss of data
 - Cost for additional space on cloud storage if needed
- Also accept other suitable examples. (2)
- 3.2.3 *Any TWO why optical fibre is the recommended choice of a communication medium to upload vast amounts of data to the cloud: ✓✓*
- Higher bandwidth/faster
 - Does not degrade over long distances
 - Immune against crosstalk
 - Immune against EMI (2)

- 3.3 3.3.1 Locally ✓ (1)
- 3.3.2 *Any ONE example of data stored by a cookie: ✓*
- User information/preferences for the website
 - Location
 - Language
 - Email address
 - Unique ID
 - Password
 - General information of previous visits
 - Date/time visited
- (1)
- 3.3.3 *Any TWO motivations for the use of apps: ✓✓*
- Transfers less data, leading to faster speeds
 - Gives the user a more user-friendly control
 - Gives the user more control on what they can do
 - Allows the user to receive automatic notifications when content on the webpage is updated.
 - Easy access
 - Personalised
 - More mobile
 - No cookies being stored/created on your computer
 - Allows offline use of content
 - Improved security
- (2)
- 3.4 3.4.1 (a) People that group together online ✓ based on common interests and/or beliefs. (1)
- (b) *Any ONE of the following Web 2.0 developments: ✓*
- Dynamic webpages were developed
 - Users became contributors of content
 - Websites have become interactive
 - Led to the development of social networking
- (1)
- 3.4.2 (a) Multiple devices are connected to the internet. ✓ These devices can independently communicate with each other ✓ and make 'intelligent'/ rule-based logic decisions based on the input received.
- Concepts:**
- A range of devices are connected to the internet (1)
 - These devices can independently communicate (1)
- (2)

3.4.2 (b) Any suitable example ✓✓

Example 1:

The alarm clock and the kettle are both connected to an app over the internet. When the alarm goes off, the kettle is switched on.

Example 2:

The app that manages the swimming pool is connected to a sensor in the pool as well as to other devices such as the pool pump. The sensor communicates the need for chemicals. The app then switches on the pump.

Concepts:

- Different IoT enabled devices are connected
- Communication/control between the devices (2)

TOTAL SECTION C: [30]

SECTION D: DATA AND INFORMATION MANAGEMENT**QUESTION 4**

- 4.1 4.1.1 An ERD provides a visual representation ✓ of how the data/tables are linked in a relational database. ✓
- Concepts:**
- Mapping/visual representation (1) of a relationship between
 - relational/linked tables or entities (1) (2)
- 4.1.2 (a) Entity ✓
- (b) One ✓
- ALSO ACCEPT:
Mandatory (due to the dual stripes)
- (c) Relationship ✓
- (d) Many ✓
- ALSO ACCEPT:
Mandatory (due to the single stripe) (4)
- 4.1.3 *Requirement of a primary key:*
- Cannot be null ✓/empty/needs to contain a value/compulsory field. (1)
- 4.1.4 (a) *Any TWO reasons why the table does not adhere to the rules of normalisation: ✓✓*
- No primary key
 - There should be no repeating fields
 - The "Number of songs" field can be derived/calculated (the field value should not be dependant on the value from another field)
 - The "Number of songs" field will need to be updated as songs are added or removed from the table
 - The songs must be placed in a separate linked table
- Also accept any other valid explanations (2)
- 4.1.4 (b) *Any ONE reason why it is more suitable to save the playlist information in a database rather than in a text file: ✓*
- Easy to filter information
 - Perform queries
 - Easier to maintain the database (1)

- 4.2 4.2.1 The mark/grade must be an integer ✓
OR
The ID number must contain only digits (1) (1)
- 4.2.2 The range of marks is 0 to 150 ✓ (1)
- 4.2.3 Each learner must have an ID/grade/mark ✓ (1)
- 4.3 **Physical independence:**
A change in the physical level usually does not need change at the application program level. ✓
OR
The application does not need different code to take the location where the database is stored/ on which media the database is stored into account.
- Logical independence:**
You do not need to make changes in the application program if the structure of the database is changed such as when fields are added or deleted from the database. ✓
OR
When you change the design of a table/field in an existing database, the application will remain unaffected. (2)
- 4.4 4.4.1 To ensure the integrity of data. ✓
OR
To ensure that changes made are reflected/made in all related records/tables. (1) (1)
- 4.4.2 Rollback ✓ (1)
- 4.4.3 Record locking ✓ (1)
- 4.4.4 Many people work at the agency ✓ and it will be difficult to establish who made which changes without an audit trail. ✓
OR
The playlists contain copyright material of which the rights need to be protected, (1) thus access and changes to this need to be monitored. (1)
- Any other valid example that includes the following **TWO concepts**:
- A motivation for tracking access/changes.
 - Indicating that an audit trail tracks who accessed/made changes and when they were made. (2)

TOTAL SECTION D: 20

SECTION E: SOLUTION DEVELOPMENT**QUESTION 5**

- 5.1 5.1.1 *Any ONE reason for the use of selection components rather than entry fields: ✓*
- Ensures validation
 - Easier to choose than to type/faster capturing
 - Eliminates the risk of capturing incorrect information/improves accuracy (1)
- 5.1.2 *Benefit of saving the applicants' details in a text file:*
- The text file allows for permanent storage of information. ✓ (1)
- 5.1.3 *Any ONE reason why a bit button would be more suitable: ✓*
- Linked to a prewritten/provided event or code
 - Has an icon that graphically indicates the purpose of the button (1)
- 5.2 5.2.1 Line 9 ✓ The square root of the number value must be assigned to a real variable. ✓ (2)
- 5.2.2 Line 13 ✓ The formula should be `iSquare := iNumber * iNumber` ✓
OR
`iSquare := SQR(iNumber)` (1) (2)
- 5.2.3 Line 15 ✓ Division by zero is undefined ✓ (2)
- 5.3 5.3.1 Correct ✓ (1)
- 5.3.2 Incorrect ✓ (1)
- 5.4 5.4.1 Private access ✓ (1)
- 5.4.2 A method such as the `toString()` is made accessible ✓ from other classes outside the object class. ✓ (2)

5.5

Text	Count	Index	Text [Index] = one of Y&\$6@?	Index <= Length?	Count >=3 AND Length>=8?	Display
Y&\$6@	0	1	True			
	1	2		True		
			True			
	2	3		True		
			True			
	3	4		True		
			True			
	4	5		True		
			True			
	5	6		False		
					False	
						INVALID
	✓	✓	✓	✓	✓	✓

(6)

TOTAL SECTION E: 20

SECTION F: INTEGRATED SCENARIO**QUESTION 6**

- 6.1 6.1.1 Video on demand (VOD) is a content delivery platform/streaming service ✓ that allows viewers to choose when and what they watch. ✓

Concepts:

- Content delivery platform/streaming service
- The ability to choose when and what to watch (2)

- 6.1.2 *Any TWO aspects that will be addressed by a EULA: ✓✓*

- Copyright provisions
- Restrictions in terms of the number of installations/devices
- Set the conditions of your license agreement with a user
- Specifying what the videos may be used for
- Conditions for changing/termination of service

Also accept other valid answers. (2)

- 6.1.3 Geo-blocking works by establishing the user's Internet Protocol (IP) address. ✓ The IP address is used to determine geographical location of the user and then block content based on the location. ✓

Concepts:

- Uses IP address to establish geographical location (1)
- The geographical location is used to apply restrictions (1) (2)

- 6.2 *Any TWO ergonomic guidelines to avoid potential health problems: ✓✓*

- Sit up straight with your back perpendicular to the ground.
- Your forearms should be at the same height as your mouse and keyboard.
- Your feet should be placed firmly on the ground.
- The back of your chair, height of your chair and height of the armrests of the chair should be adjusted to support your body in this position.
- Your monitor should be positioned at eye level and roughly 50 cm away from you.
- Your monitor should be tilted to reduce glare.
- You should take regular breaks while using the computer.
- Using ergonomic hardware
- Wearing anti-glare glasses/accessories
- Ensure correct level of lighting

Also accept other valid answers. (2)

- 6.3 6.3.1 *Any TWO motivations for streaming: ✓✓*
- Users want to start watching content immediately
 - Copies of material will fill up user's storage
 - Material is mostly copyright protected/makes piracy more difficult (2)
- 6.3.2 (a) Lossy compression ✓ (1)
- (b) *Any TWO justifications for the use of lossy compression: ✓✓*
- Inconsequential data is lost/accuracy not essential because we are not working with numbers
 - Less data needed to stream content
 - Less storage needed to store content (by service provider) (2)
- 6.4 6.4.1 *Any ONE way in which secure connections can be checked: ✓*
- Lock symbol
 - URL starts with https
 - Checking digital certificate (1)
- 6.4.2 (a) Sensitive/private information is communicated over the internet during online payments, ✓ encryption will ensure that unlawful access is not obtained to this information on a public network like the Internet. ✓
- Concepts:**
- Private information is sent over public network/internet
 - Access to this information is prevented by encryption (2)
- (b) • Public key is obtained over the network from secure site ✓
- Session key / data is encrypted using the public key ✓ and sent to secure site.
 - Session key/data is decrypted with the matching private key ✓ retained at secure site.
- Concepts:**
- Encryption using public key (1)
 - Decryption using private key (1)
 - Public key is sent / private key retained at secure site (1) (3)

6.4.3 An explanation ✓✓ of any one example of a cyber technique used to obtain banking details of a user:

NOTE: Both marks must be allocated to the explanation of a cyber technique (one mark per fact)

- Phishing –
 - Tricking someone to obtain sensitive information
 - by sending emails to users that look like official emails
- Spoofing –
 - Changing electronic communication's information
 - to make it seem as if it originated from a legitimate source
- Pharming –
 - Create an official-looking website
 - that requests sensitive information.
- Hacking –
 - Breaking through security of networks
 - to gain illegal access to personal information
- Man-in-the-middle attack –
 - Cyber criminals intercept communication
 - between users and legitimate banking websites
- Social engineering –
 - Manipulating (gain trust) someone
 - into giving out their personal information
- Malware (Keylogger, spyware) –
 - Malicious software used to
 - communicate personal/private information to a 3rd party (2)

- 6.5 6.5.1 (a) The ability to adapt the size/scale of the service to the changing requirements. ✓ (1)
- (b) *TWO ways to use virtualisation:*
 Combining the resources of many computers into one powerful service ✓
 Sharing the resources of one powerful machine between many users ✓ (2)

6.5.2 (a) Any TWO facts to motivate ✓✓ a distributed model:

NOTE: Both marks must be allocated to the motivation of a distributed model (one mark per fact)

- Duplication –
 - All servers will have to be able to handle any user
 - because users can log on from anywhere
- Partitioning –
 - Users will be mostly distributed in certain geographical areas
 - data is accessible locally based on the need of users in a geographical area

NOTE: The motivation must fit with the concept of duplication having all the data, while partitioning only stores data needed by the specific server.

(2)

(b) Regular synchronisation of databases. ✓

OR suitable description of synchronisation

(1)

6.6 6.6.1 Artificial intelligence is computer software/systems ✓ that simulates human intelligence. ✓

Concepts:

- Intelligence based in computer systems/technologies (1)
- Simulates human intelligence (1)

(2)

6.6.2 Any ONE advantage of using a chatbot: ✓

- Facilitate seamless live communication
- Make customer service available 24/7
- Improve response time
- Saving on personnel costs
- Automates tedious time-consuming tasks
- Get constant improvement over time with machine learning

(1)

6.6.3 Any TWO motivations for using a real person: ✓✓

- Can handle a wider variety of questions/answers
- Provides employment to people
- Unwillingness of people to use service because they know it is a machine
- Negative perceptions of AI
- Machines are not equipped to handle context/emotions

(2)

6.7 6.7.1 *Any TWO steps ✓✓ of data analytics with examples ✓✓*

- Cleaning the data (1)
 - by removing unwanted/redundant data like user preferences that are now outdated. (1)
- Analysing data (1)
 - to identify which age groups makes more use of VOD services and what their preferences are. (1)
- Visualisation/Modelling (1)
 - where the popularity of VOD services can be shown in terms of time of day/night being watched/categories of VOD services in terms of a graph. (1)

NOTE: Other examples related to the scenario can also be used. (4)

6.7.2 *Any TWO challenges with big data: ✓✓*

- Extreme processing power needed to process very large amounts of data
- Large amount of storage required for large amounts of data
- Algorithms must be able to process variety of data
- Mechanisms to collect / capture data from variety of sources
- Time consuming due to the large amount of data to work with

OR any other applicable challenge (2)

6.7.3 *Any TWO negative impacts on users to provide content to the user which specifically matches their viewing history: ✓✓*

- User's field of interest is artificially limited
- Negative or incorrect perceptions might be continuously re-affirmed
- Process can be used to manipulate user for other intentions
- Information from analytics can be sold to 3rd parties
- Can expose private information to others

OR any other suitable example of negative impact (2)

TOTAL SECTION F: 40
GRAND TOTAL: 150