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INFORMATION TECHNOLOGY: PAPER I
STANDARDISED PRELIMINARY EXAMINATION
MEMO

QUESTION 1: Terminology

Please provide definitions for the following terms:

- | | | |
|------|---|-------------|
| 1.1 | Cache memory | (2) |
| | Limited amount of special high-speed memory ✓ reserved for the temporary storage of the data or instructions likely to be needed next by the processor. ✓ | |
| 1.2 | CMOS memory | (2) |
| | Memory that retains its contents when the power is turned off ✓ as long as it receives a trickle of electricity from a battery, contains data read by the BIOS during the start-up process. ✓ | |
| 1.3 | SaaS | (2) |
| | Software as a service ✓ – you rent software ✓ instead of buying a licence to use it forever. | |
| 1.4 | Hypervisor | (2) |
| | VMM or virtual machine manager ✓, program that allows multiple operating systems to share a single hardware host ✓ / creates and runs virtual machines. | |
| 1.5 | Bit Torrents | (2) |
| | Communication protocol ✓ which enables multiple peer computers on a network to upload and download data between each other instead of using a server source ✓. | |
| 1.6 | Firewall | (2) |
| | Hardware or software which monitors communication between computer and the internet ✓, in both directions ✓. | |
| 1.7 | e-waste | (2) |
| | Anything related to electronics ✓ that is thrown away ✓, such as old computers, batteries, hard drives | |
| 1.8 | Botnets | (2) |
| | Network of computers ✓ illegally and remotely controlled by criminals ✓ | |
| 1.9 | Encapsulation | (2) |
| | class combines fields and methods ✓ into one unit ✓ | |
| 1.10 | Lifetime of a variable | (2) |
| | amount of time the variable exists in memory ✓ ✓ | |
| | TOTAL: | [20] |

QUESTION 2: Systems Technologies

Specification

- Supports Windows 8
- Intel® Atom™ Z670 processor, 1.5GHz/512K L2
- Chipset – Intel® SM35 Express Chipset
- DDR2 800 Memory on board, Standard: 2GB
- Display: 10.1" with 1366x768 /16:9 HD (Anti-Glare)
- High definition 1.3M Pixel Camera
- Audio – Realtek ALC269Q-GR
- Combo Module (WiFi + Bluetooth): IEEE 802.11b/g/n
- GPS, USB interface
- SD card
- Storage - 64G SSD (standard) : 32G SSD (option)
- Touch Module - Sensor IC : Ilitek ILI2101
- Light Sensor - I2C interface
- Gyroscope - GPS navigation systems
- G Sensor - Rotation scheme
- M Sensor - Detection of direction
- 2 cells battery
- Size: 174*268*13.6 mm
- Weight: under 750g

- 2.1 Name any TWO components in the above advert which is not usually found on a typical desktop/laptop computer. (2)
- High definition 1.3M Pixel Camera
 - Touch Module – Sensor IC
 - GPS navigation system
 - G Sensor – Rotation Scheme
 - M Sensor – Detection of direction
 - 2 cells battery Any 2 above
- 2.2 The CPU is the “brain” of the computer and operates in various cycles.
- 2.2.1. What is the frequency of the processor above? (2)
- 1.5GHz
- 2.1.2 Name 3 parts of the CPU. (3)
- ALU, Control Unit, Registers
- 2.3 From the specifications above give 2 data transfer techniques that you will be able to transfer data between the tablet and a desktop PC. (2)
- The tablet has an SD card. An SD card reader can be used on a desktop to transfer data
 - If the desktop PC supports Bluetooth, data can be transferred in this way.
 - The tablet supports WiFi, data can be transferred via email or through cloud storage, such as your google drive.
 - The tablet has a USB interface, data can be transferred using a flash disk. Any 2 above
- 2.4 What does the term “Chipset” refer to? (1)
- Refers to a set of specialized chips on the motherboard that manages the data flow between the processor, memory and peripherals. ✓
- Chipsets are usually designed to work with a specific family of processors. ✓
- Accept north and south bridge. ✓
- Any 1 above
- 2.5 The tablet refers to “DDR2 800” memory.
- 2.5.1 What is DDR2 memory? (1)
- Double data rate 2 SDRAM ✓ (Allows for higher bus speeds and requires less power) It superseded the original DDR SDRAM. ✓

Any 1 above

2.5.2 What does the 800 refer to? (1)

Refers to the speed of the RAM ✓ OR 800MHz ✓

2.5.3 What is the difference between DRAM and SDRAM? (2)

SDRAM is synchronised with system clock. ✓

DRAM contains a capacitor which loses its charge and has to be refreshed many times per second. ✓

2.6 Tablet computers accounted for 40 % of Personal Computer device sales in the last 3 months of 2013.

2.6.1 Give two reasons why you think tablet sales have increased so rapidly in the last few years. (2)

- Small, portable
- Costs have reduced due to more brands being sold.
- The touch screen interface is ideal for easy and comfortable web browsing.

Supports many different apps that are free or cheaper than traditional software. Any 2 above

2.6.2 Draw up a list of 4 specifications that you think are important when a consumer is considering to purchase a tablet. For each specification you choose give motivate why you chose that specification. (8)

- The screen size. ✓ The larger the screen, the easier it is to type or tap. ✓
- WiFi capabilities ✓. If your tablet supports the 802.11n, you will be able to do media streaming and heavy duty downloads as opposed to the 802.11b/g ✓
- Expandable storage ✓ - Media files and photos take up space, so the ability to expand storage will be an advantage. ✓
- Built in Speakers ✓ – This will be an advantage as you may not want to use your headphones all the time ✓ OR When skypeing/Google Talk more than one individual can be a part of the conversation. ✓
- Built in camera ✓ – Being a portable device your tablet computer can offer the ability to take photos/video, this will eliminate the need to carry around a separate digital camera. ✓
- The type of operating system used. ✓ This will affect the type and variety of applications that can be used on the device. ✓

OR

Example Android VS Apples IOS, this will depend on the user's preference for an operating system/applications available and is therefore an important consideration. ✓

- 3G capabilities ✓ - When not in a WiFi enabled area, this would be an important consideration as 3G would allow an alternate way to connect to the internet. ✓
- Weight ✓ – Can be something to consider if you are going to be holding the device for long periods of time ✓ OR Carrying the device around in a bag. ✓
- Inputs ✓ - The ability to be able to plug in earphones/external speakers. ✓
- USB port ✓ – Will allow you to connect to a device via the USB port ✓

Any 4 above – Award 1 mark for the specification and 1 mark for motivating why it should be considered.

2.6.3 Do you think that the laptop/desktop computer will eventually become obsolete as a result of the increasing popularity of tablet computers? Give three reasons to support your answer. (3)

No

- Desktops can easily be connected to larger monitors
- Tablets do not have optical drives to read CDs or DVDs
- Much cheaper than tablet computers.
- Desktops are cheaper and easier to upgrade.
- More peripheral support in desktop/laptops than tablet computers.

- Desktop/Laptop offer better internal storage as opposed to tablet computers.

Yes

- Tablet prices have reduced significantly which makes them more accessible to users.
- Some tablets come with a docking station that enable you to connect to an external keyboard and mouse.
- Cloud services offer storage solutions so there is no need for the sizeable storage offered by desktop/laptop computers.

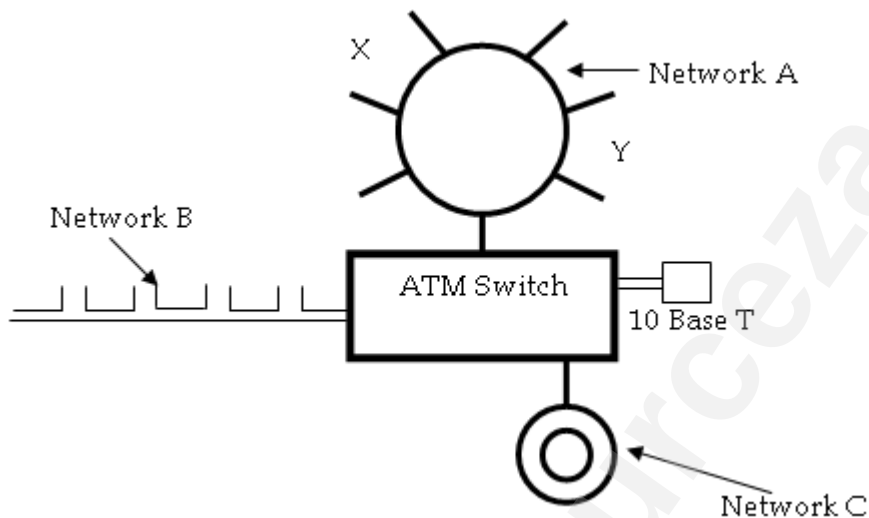
Do not award a mark for Yes or No. Award a mark for providing 3 suitable reasons.

TOTAL:

[27]

QUESTION 3: Communication Technologies

Study the diagram below and answer the following questions:



- 3.1 What kind of topology is represented by network A? (1)
Ring
- 3.2 What type of media access control will be used by network A? (1)
Token Ring
- 3.3 A message must be sent from station X to station Y on the network A. Evaluate each of the following statements and write down TRUE or FALSE in each case. (5)
- 3.3.1 Only one station can send a message at a time. **True**
- 3.3.2 Station X must broadcast the fact it wants to send a message and then only will station X get a chance to do so. **False**
- 3.3.3 A bit pattern circulates around the network. **True**
- 3.3.4 A bit pattern circulates around the network. **False**
- 3.3.5 If the actual message that station X has sent, returns to X, the message will be considered as sent. **True**
- 3.4 Network C is a Fibre Distributed Data Interface Network (FDDI)
- 3.4.1 What type of cabling is used on this network? (1)
Fibre optic cables
- 3.4.2 Give 4 advantages of the kind of cabling used on network C. (4)
- **Not affected by EMI**
 - **High Bandwidth**
 - **Light weight**
 - **Almost impossible to "tap" – secure**
 - **No signal attenuation**

Any 4 above

- 3.5 What does the 10 and the T refer to in “10 base T” in the diagram? Coaxial cables 10 refers to 10 Mbs✓ and the T refers to twisted pairs-the type.✓ (2)
- 3.6 The network shown above is a wired network that makes use of various cables to connect. An alternative to this would be to use a Wireless Network. Name three technologies for transmitting data over a **Wireless LAN**. (3)
- Radio Communication✓, microwave communication✓, infrared✓ and electromagnetic✓ induction short range. Any 3 above
- 3.7 Different protocols will exist on the network. Give a brief description for each of the following protocols and state what each protocol is used for:
- 3.7.1 TCP/IP (2)
- Communication protocol for the internet✓.
Defines the rules computers must follow to communicate with each other over the internet. ✓
- 3.7.2 SMTP (2)
- Protocol for the sending and receiving of email✓ – used when email is delivered from an email client such as MS Outlook to an email server.✓
- 3.8 Many airplanes have started to offer passengers WiFi services and the ability to communicate using cellular phones. One of the benefits of being able to access the Internet on an airplane would be that employees can continue to work by accessing their company’s network.
- 3.8.1 What is a VPN (Virtual Private Network)? (1)
- A Virtual Private Network that extends a private company network over a public network such as the Internet.
- 3.8.2 VPN networks can often be slow and difficult to access. Cloud Computing is an alternative infrastructure that can be used. Discuss how the idea of Cloud Computing would compare to a VPN. (3)
- Both make use of the Internet for connecting and routing the data packets to its destination✓
- VPNs provide:
- Extended connections to the network via remote access
 - Secure Data Exchange
 - Saving of time and expenses
- Cloud Computing provides:
- Remote access as well as computational tasks for company data for organizational purposes
 - Remote data storage for the company
 - Outsourcing of hardware and software components
- 1 mark for the similarity of the two options i.e. both make use of the internet infrastructure.
- 1 mark for a characteristic of a VPN network
- 1 mark for a characteristic of cloud computing.

TOTAL:

[25]

QUESTION 4: Internet Technologies

- 4.1 “The backlash in China over missing commercial plane Flight 370 has led to a travel boycott to Malaysia. Spurred mostly by online conversation, the boycott has since snowballed to involve several local airline booking websites”

4.1.1 What is a URL (Uniform Resource Locator) (2)

The unique address of a website. ✓✓

4.1.2 Describe two different ways that IT could be used to authenticate a passenger's identity when boarding a plane. (4)

- using a fingerprint scanner/iris scanner/face scanner/voice recognition ✓, which is matched with database to authenticate passenger. ✓
 - swiping a smart card / Machine Readable Passport with passenger's details ✓ a card/chip stores the passenger's photo and this is matched manually by the check in person ✓ or electronically using facial recognition technology ✓
 - using a logon and password ✓ customers are given a special logon and secret password which is matched against the customer database to verify the person ✓
 - Typing into a terminal the passport number of the passenger ✓ matching the photograph from database with the passenger ✓
- Any 2 above (2 marks each)

4.1.3 Passengers are often worried about booking travel online. Discuss security and reliability concerns when passengers book their trips online, by naming TWO possible threats that passengers could experience. (4)

- Concern: phishing / pharming ✓ – there could be scams with fraudulent sites customers could enter their credit card details and lose their money) ✓
- Concern: transmission security ✓ – customers may be concerned about the privacy of their booking details such as name, address, flight times in transmission (e.g. if the transmission is not secure hackers may gain access to unencrypted data intercepted when booking details are transmitted, if a hacker gained enough information about the customer this could result in embarrassment or blackmail) ✓
- Concern: illegal access to database ✓ – customers may be concerned about the security of their details once they have been sent to the travel company (e.g. if the company doesn't have a secure network or database unscrupulous employees (insiders) could access credit card details, an employee who gains enough information about a customer could steal the customer's identity and commit fraudulent acts) ✓
- Concern: reliability of data stored ✓ – customers could have concerns about unnecessary, incorrect or out of date information stored in the company's database (e.g. incorrect address or previous bookings no longer relevant, company policy clearly stated and agreed in line with any legal Data Protection requirements. ✓
- Concern: company using data for other purposes ✓ – company can sell your details to other companies (e.g. your details used to send unsolicited mail) ✓
- Concern: reliability of the Web site ✓ - Customers may have concerns about the reliability of the software on the travel site (e.g. once the booking is made the page may not reload to confirm the booking or allow printing. ✓

Any 2 above- Award 1 mark for the THREAT/CONCERN and 1 mark for an explanation.

4.1.4 Explain two reasons why documents are stored on web sites in PDF format rather than as word processed documents. (2)

- Take up less space
- Non editable
- Interactive functions are supported
- Adobe Acrobat Reader is a free software needed to view PDF files. [Any 2 of the above]

4.2 Search engine companies such as Google and Yahoo are continually trying to improve the experience of searching the Internet for their users. Discuss how searching has changed by making reference to the following terms:

4.2.1 Web 3.0

Will provide users with a more personalized web experience. ✓ Each user will have a unique Internet profile based on the user's browser history ✓. OR The search data returned will be influenced by the user's profile. ✓ (2)

- 4.2.2 Semantic Searching
Improves search accuracy by understanding the searchers intent and context to generate more relevant results✓. Will look at the search query and related aspects such as the location✓ OR previous search requests.✓ (2)
- 4.2.3 Mediated Search Engines
Searches for a broad subject heading✓ and then searches for more specific topics that fall within these categories.✓
- 4.2.4 Search Engine Optimization.
Process of maximising the number of visitors to the site by ensuring that the site appears high on the list of results returned by a search engine.✓ It's a methodology of strategies, techniques and tactics to increase the number of visitors to a website by obtaining a higher ranking placement in the search results and predicting that the search required by the user will most likely be the most popular one.✓
Award 1 mark for a definition and 1 mark for how each affects searching. (2)

4.3 The World Wide Web (WWW) has allowed the exchange of information on a scale never before seen in human history. However, searching for information on the WWW can be a confusing and time-consuming process.

4.3.1 Explain why a user might use two or more search engines when searching for information on the World Wide Web. (2)

- search engines may produce different results because they use different algorithms ✓
- some search engines may be specialized more likely to produce results required in a particular field ✓

4.3.2 When a search engine is used to locate information, certain web sites appear near the top of the search listings. Give two explanations for the appearance of certain web sites near the top of search listings. (2)

- Pay-for-inclusion or pay-per-click listings (e.g. many search engines make their money from advertising because their service is free, but accept payment to make the advertiser's webpage appear near the top of search results)
- "Popular websites" with a large number of links linking to it may produce biased results plus description (e.g. the algorithm intentionally searches for the number of links to specific sites, new web pages that have not been "discovered" yet are disadvantaged by the algorithm)
- Algorithm used by the search returns "biased" results (e.g. incorrect algorithm was programmed inadequate testing of the algorithm, algorithm does not identify false techniques used by web designers to make their web pages display near the top of the listing)
- Methods are used by webpage designers (e.g. using keywords in meta tags to highlight content and description, using "invisible" text in the same color as the background of the website that can be found by the search engine, other methods for "spamdexing")
- Search Engine Optimization, the process of maximizing the number of visitors to a particular website by ensuring that the site appears high on the list of results returned by a search engine. Any 2 above

4.3.3 Globalization means the diminishing importance of geographic, political, economic and cultural boundaries. Discuss how the World Wide Web has contributed to the globalization process by referring to any of the four listed topics (geographic, political, economic and cultural). You may discuss more than one topic provided each topic is clearly labelled as a heading. (4)

- people have greater access to a vast amount of information about other nationalities/cultures. easier to learn a new language and communicate with others. (Cultural)
- dramatic events anywhere in the world can be broadcast on the World Wide Web almost immediately. (political/geographical)
- cultural diversity may be diminished and cultural homogeneity encouraged. (Cultural)
- people are able to purchase products from anywhere around the world. (Economic)

- Interpersonal communication has allowed individuals to easily talk to other individuals around the world. (Geographic/Cultural)
- it has allowed a worldwide audience for authors/musicians. (Cultural/Geographic)
- it has reduced the impact of government propaganda. (Political)

Award 1 mark for the heading and 1 mark for an explanation – provided that the heading matches the explanation.

TOTAL:

[30]

QUESTION 5: Social Implications

- 5.1 The search efforts to locate the missing plane have been an international effort. Clearly, communication between the different agencies and governments, the families of the people on the plane, and the Press, has been critical. List three ICT based technologies that will have been used to facilitate this communication. (3)
From: Mobile communications, Video conferencing, GPS, social networking services (for families), RSS feeds, etc ✓✓✓
- 5.2 Much of this information, particularly the technical data collected during the searching, will have been centralised. Some of the data, for example from Military agencies, is sensitive and not for the general public. What mechanisms might they have relied on to protect the data? (2)
From: encryption, firewalls, authentication mechanisms, physical protection of where data stored, backups, secure networks, etc. ✓✓
- 5.3 Discuss 3 concerns regarding our rights to privacy on the Internet. (3)
What personal info to share ✓, exchange of messages without anyone else seeing them ✓, ability to send anonymous messages ✓ Limit social networking, limit registering on groups
- 5.4 Encryption tools are used to protect the privacy of data. Name three types of encryption methods that are commonly used. (3)
Public key used to read documents encrypted with private key, both are related mathematically and a pair of keys belongs to a person.
- 5.5 Do you believe a loss of privacy is a fair price for increased security? Justify your answer. (2)
As per answer ✓✓
- 5.6 Name three advantages that cyber-crime give a criminal over “hands-on” crime? (3)
From: Low risk of physical danger ✓, difficult to detect ✓, difficult to trace perpetrator ✓, easy to commit multiple crimes at once ✓
- 5.7 Compare the activities of a “white hat hacker” to a “black hat hacker”. Do you think either is acceptable practice, justify your answer? (4)
Hackers use ICT skills to access computer systems, networks and information. “White Hats” do so out of curiosity, not do harm ✓, while “Black Hats” have malicious or criminal intent ✓. But illegal in both cases ✓ so never acceptable! ✓

TOTAL:

[20]



6.1 Why would you want to normalise the data above? (3)

To remove one to many relationships between data ✓ OR minimise data redundancy ✓, and safeguard against data anomalies ✓

6.2 Give an example of a potential anomaly in the data above. (2)

From:

Insert anomaly ✓ if try to add an event for which do not know yet which drone will be used ✓

Update anomaly ✓ if change the description for Great East Japan Tsunami, restoration operations, need to update in more than one place ✓

Delete anomaly ✓ if delete a type of drone, could end up deleting all information on an event ✓

6.3 Define the two types of data dependencies found in the data above. (4)

Partial dependency: ✓ field's value is dependent on part of a composite key ✓

Transitive dependency: ✓ field's value is dependent on a non-key field ✓

6.4 Draw a data dependency diagram of the above table. (7)

Year	Event	Location	Event Type	Type	Drone Code	Drone	# Used
------	-------	----------	------------	------	------------	-------	--------

Key:

primary key ✓ ✓

partial dependency ✓ ✓ ✓ ✓

transitive dependency ✓

6.5 Write the table above in Third Normal Form. Write the solution in the format of name of table, followed by the field name(s) in brackets, with primary key underlined. (4)

Events(Event, year, location, event type) ✓

EventTypes(event type, type) ✓

Drones(drone code, drone description) ✓

EventDrones(Event, drone code, number used) ✓

6.6 Explain the difference between repeating groups and data redundancy, using the above example to illustrate your answer. (4)

Repeating group is a field that can have multiple values ✓, for example multiple drones used for an event ✓

Data redundancy is data that appears more than once ✓, for example when expanded the primary key, data for Hurricane Katrina had to be reflected in both records ✓

6.7 Describe an action that would break referential integrity on the above normalised data. (1)

Deleteing one of the values in a table, e.g. EventType, for which there is a foreign key referencing it ✓

TOTAL:

[25]



- 7.1 You decide that you are going to develop an application to manage the above drone information. (11)
Provide a class diagram, in the below format, including all fields, a parameterised constructor, and accessor and mutator methods for the two fields that indicate the number of drones in use and if it is a prototype.

Drone ✓
- droneDescription: String ✓ - numberOwned: Integer ✓ - numberInUse: Integer ✓ - terrain: String ✓ - prototype: Boolean ✓
+ Drone() ✓ + Drone(descrip: String, owned: Integer, inUse: Integer, terrain: String, prototype: Boolean) ✓ + getDescription(): String + getOwned(): Int + getInUse(): Int ✓ + getTerrain():String + isPrototype():Boolean ✓ + setDescription(description: String) + setOwned(numOwned: Int) + setInUse(numInUse: Int) ✓ + setTerrain(terrain: String) + setPrototype(prototypeYN:Boolean) ✓ + toString(): String

- 7.2 You write a class that creates an array of Drone objects. List two advantages of using arrays in the above scenario. (2)

From: keeps object types of the same sort together ✓, enables you to organise ✓ and reduce ✓ code, scalable solutions ✓, etc.

- 7.3 What is the biggest disadvantage of using an array – explain two possible consequences. (3)

Arrays are static ✓ and cannot change their size once the program runs. Therefore you are either going to allocate memory unnecessarily ✓, or run out of space and risk an IndexOutOfBoundsException error ✓

- 7.4 Your solution needs to be scalable. What does this mean? (1)

Program must easily be able to handle more data ✓

- 7.5 You need to provide functionality to display available drones. The user must decide the type of terrain they want to use the drones in. Your method needs to determine all available drones, displaying the description and number available. Write an algorithm for this method. (9)

Parameter: terrain ✓

Create a temporary string.

Loop through the array ✓

- first compare object terrain ✓
- if different, ignore ✓
- if same, retrieve Owned and inuse ✓
- Available = owned – inuse ✓
- If available > 0 ✓
- - add description and available to temp string ✓

return temporary string ✓

- 7.6 Your user uses the output of the above method to decide which drone to book out, and how many, (3)
e.g. if the above returns

unmanned ground vehicle	5 available
rotor-craft unmanned aerial vehicle	25 available
remotely operated underwater vehicle	12 available

The user may decide to use 10 of the rotor-craft unmanned aerial vehicle.

Provide the method header definition for a possible method to action this.

7. 6. 1 DroneArray class ✓, since the array stores all the drones. ✓

7.6.2 There is a mutator for this field. ✓

- 7.7 Name and describe three types of testing that you should perform on any application that you develop. (6)

Standard testing ✓ i.e. data as expected w.r.t. type, range, existence, etc ✓

Extreme data testing ✓ data type correct, but logically incorrect e.g. age of 300 ✓

Abnormal data testing ✓ data type incorrect e.g age entered as string ✓

TOTAL: [35]