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INFORMATION TECHNOLOGY: PAPER I

Time: 3 hours

180 marks

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

This question paper consists of xx pages. Please check that your question paper is complete.

Read the questions carefully and make sure that you answer all parts of each question.

Answer ALL questions – there are no options in this paper.

Show all working where applicable.

Non-programmable calculators may be used.

Number your answers exactly as the sub-questions are numbered.

Start each answer to each question on a new page.

Please leave a line open between sub-questions.

It is in your own interest to write legibly and to present your work neatly.

Section	Question	Topic	Marks
A: Short Questions	1	Multiple Choice	10
	2	Terminology	10
B: System Technologies	3	Hardware and Software	44
C: Communication and Internet Technologies	4	Networks and the Internet	37
D: Social Implications	5	Social Implications	18
E: Data, Information and Solution Development	6	Normalisation	25
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SECTION A

SHORT QUESTIONS

QUESTION 1

MULTIPLE CHOICE

Various options are provided as possible answers to the following questions. Choose the correct answer and write only the letter (A-D) next to the question number, for example 1.11 D.

1.1	A	(1)
1.2	C	(1)
1.3	D	(1)
1.4	C	(1)
1.5	C	(1)
1.6	C	(1)
1.7	A	(1)
1.8	D	(1)
1.9	B	(1)
1.10	B	(1)
		[10]

QUESTION 2

TERMINOLOGY

Give the correct term for the following descriptions:

2.1	Modular design	(1)
2.2	CMOS (Complementary Metal Oxide Semiconductor)	(1)
2.3	Biometrics.	(1)
2.4	Botnet	(1)
2.5	Interrupt	(1)
2.6	Virus or trojan	(1)
2.7	Partial dependency	(1)
2.8	Atomic data	(1)
2.9	Polymorphism	(1)
2.10	Void	(1)

	[10]
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QUESTION 3 HARDWARE AND SOFTWARE

3.1	A typical computer will have RAM and ROM.		
	3.1.1	RAM - Volatile✓, can be read from and written to✓, stores programs currently in use✓ ROM - Non Volatile✓, can be read from but not written to✓, stores startup programs✓ Any 2	
	3.1.2	Both are hardware components on the motherboard✓ Both are classified as primary memory✓ Both store data Any 1.	(1)
	3.1.3	DRAM - Loses its charge✓, OR capacitors OR refreshing is not synchronised with the CPU SRAM - Does not lose its charge as long as it has a supply of power✓, OR does not need to be refreshed OR no capacitors✓ Any 1	(2)
	3.2.1	Magnetic - Storage of data on a magnetised medium✓, data is read and written to mechanically✓ using a read/write head✓ any one of these mentioned for 1 mark Optical - Uses a laser✓ to store and retrieve data from an optical medium✓ any one of these mentioned for 1 mark Solid State - Stores data electronically✓ on silicon microchips✓ any one of these mentioned for 1 mark	
	3.2.2	Magnetic and Optical✓ - Both discs spin, both use heads to access data✓ One common similarity for all three is that they are direct access storage mediums Magnetic and optical are both mechanical 1 mark for pairing them up and 1 mark for the similarity	
	3.3.1	4	
	3.3.2	Accept any of the following explanations: Heavy Multitasking✓ users that switch between many applications✓ Software with heavy loads✓ on the CPU that support Multithreading✓ OR software app is multi threaded each thread can be placed on hyperthread/logical CPU to enable fast context switch between processing	

		OR they could give an example Examples: Rendering of graphics✓ while playing a computer game✓ Auto save✓ while working on a word document✓ Spelling/Grammar check✓ while working on a word document✓ Rendering of video✓ while video editing✓	
	3.3.3	Prefetches✓ the instructions most likely to be used next by the CPU✓	
	3.3.4	Cache is expensive✓ Cache is located on the CPU so space is limited✓	
	3.3.5	CPU - In the registers more instructions can be accessed at a given time. RAM - More data can be transferred on a single clock tick assuming the data bus is 64bits. PCI Express - A new bus standard capable of transfer at a very fast rate. This bus will be able to utilize a 64 bit register efficiently. Cache Memory - keeps recently used data and instructions accessible in CPU to reduce time wasted by waiting for data to come from RAM Address bus - address more RAM Data bus - transfer more data in one clock tick ANY 2 plus a justification	
	3.4.1	Android, Apple IOS, Symbian, Windows, Blackberry OS Any 1	
	3.4.2	Each process has enough memory space No process tries to use a memory space allocated to another process All the different types of memory are used efficiently	
	3.4.3	Instructions are written in a language that is easier to code in. Instructions can be written in fewer lines of code Libraries of pre-written code are supplied for re-use Less machine dependent Any 2	
	3.4.4	Difference - Proprietary software needs to be paid for, Freeware does not need to be paid for.✓ Similarity - Both types of software retain ownership✓ or software and source code is kept hidden✓ either one for 1 Mark	
	3.4.5	Distributing the app for free would increase its popularity/number ✓ of downloads therefore advertising✓ space could be sold within the app The popularity of the app could result in him selling✓ the app to a bigger company for a profit.✓	
	3.4.6	Small display area Limited CPU/RAM, program must respond quickly Program must be able to work on different platforms/operating systems	

		Must be able to work with limited storage space Must consider power saving ANY 2	
	3.5.1	Advantage - Errors can be identified as they occur✓, error can be fixed immediately without having to wait for all of the source code.✓ any one Disadvantage - If code is distributed, source code has to be sent to the user✓, parts of the code that contain error will only be discovered at a later stage✓ any one	
	3.5.2	Java virtual machine compiles code into java byte code, any machine that has a Java virtual machine can execute the code✓	
	3.6.1	Online storage✓ Data is stored on remote servers on the internet✓ Any 1	
	3.6.2	Access to data needs a good internet connection Online threats to security of data If remote server fails then there is no backup Cloud services only available if subscription fees are paid When server is down, no access to your data Any 2	
			[44]

QUESTION 4

NETWORKS AND THE INTERNET

	4.1.1	Fibre optic✓, twisted pair✓ allow coaxial	
	4.1.2	Bandwidth✓ - The amount of data that can be carried in a given time period/data transfer rate✓ Attenuation✓ - The loss of signal strength✓ Interference✓ - EMI/ Signal interference that can corrupt data✓ 1 mark for the factor and 1 mark for the explanation	
	4.1.3	Star topology A problem with one node won't affect the other nodes Easy to extend A common topology, easy to find equipment OR Bus topology Requires less cable No hub or switch needed which reduces cost Easy to extend the network, connect another node to the cable OR Ring topology Orderly network, each device has opportunity to transmit Very little signal degradation 1 mark for topology and 2 marks for the reasons	
	4.2.1	Can connect mobile devices to network Provides some degree of portability Can extend the network beyond the limits of cable connectivity Any 1 advantage	
	4.2.2	Signal is broadcast✓, It is easy to intercept the data✓	
	4.2.3	WiFi (Radio Waves)- transferring data over short distances Bluetooth (Radio Waves) - wireless communication over short distances Infrared - uses infrared light to carry data between devices GPS - uses satellite communication 1 Mark for wireless method and 1 mark for a description	
	4.2.4	Using a VPN Cloud computing Using remote desktop Any 2	
	4.3.1	Extended bandwidth for users✓ Faster uploading✓ of video to the latest sighting app. Any 1	
	4.3.2	Data bundles are costly Uncapped internet is not available 3G is slow compared to ADSL	

		Any 1	
	4.3.3	Wireless Broadband network, ADSL	
	4.4.1	Is a space-based satellite navigation system✓ that provides location and time information✓	
	4.4.2	Can be used to track high visitor activity at the park Can be used to track the sightings of certain animals that may not be currently tagged If rangers are conducting wildlife tours, the app will be useful to them Any 2	
	4.5.1	VoIP or TCP/IP	
	4.5.2	If 3G is used, data is expensive Internet connection may not be reliable Bandwidth may be low Not all schools will have the necessary hardware/software Not all schools will have internet access Any 2	
	4.5.3	A facebook page✓, used to connect with students, answer questions, posting of videos, photos.✓ Instagram✓ for sharing of photos/videos✓ Twitter✓, tweets regarding activity at park✓, photos, videos 1 Mark for social media example, 1 mark for description	
	4.6.1	https	
	4.6.2	Message must be decrypted using a private key✓.	
	4.6.3	Secure payment✓ to the public for purchasing a ticket✓ to enter the park making a donation to the park. - any secure payment option Might have a link for staff to login✓ to a vpn with a username/password.which will need to be secure to prevent someone accessing it - any login option 1 mark for an activity and 1 mark for why it needs to be secure	
			[37]

QUESTION 5

SOCIAL IMPLICATIONS

5.1	Advantages: accurate tracking ✓ of Tings, able to send relevant notifications✓ Disadvantages: potentially at risk ✓, information overload from notifications✓ Or any other relevant arguments	
5.2	Yes✓: Rhinos are endangered and under constant threat of poaching.✓ Therefore we do not want their location to be distributed to poachers✓ - there is no control over who downloads the application✓ OR No ✓Rhinos are endangered and under constant threat of poaching.✓ By visitors broadcasting the location of the Rhinos, game rangers, also using the application, can better keep track of Rhino locations and so protect them more easily.Rhinos are endangered and under constant threat of poaching.✓ As endangered, we want them to be given as much publicity Rhinos are endangered and under constant threat of poaching.✓as possible to ensure people know about and work to protect them. (use discretion when marking)	
5.3	Act of manipulating people into divulging confidential information✓ in order to gain unauthorised computer access ✓	
5.4	Students will be able to communicate with the game ranger✓, ask questions, tweet ✓what they see, Or any similar Africam, tweet game ranger etc.School projects, skype a renger	
5.5.1	A wiki is a collaborative ✓ website, so all the parents, pupils and teachers would be able to add and edit content, and thereby share knowledge and experiences online.✓.	
5.5.2	Use discretion when marking ✓✓ From for e.g.: Include what constitutes appropriate and inappropriate materials or resources. Specify how student access will be monitored Specify who will ultimately be responsible for student behavior Specify manner in which students, parents, teachers may communicate with each other	
5.5.3	Use discretion when marking ✓✓ Availability of internet - without this, very hard to communicate. Distribution of material can be online, but may also need to distribute e.g. scientific apparatus - logistics, safety without teacher on hand, etc Project based - scope, groupwork May still need some face-to-face interaction - central location Assessments - central location	

QUESTION 6

NORMALISATION

6.1	Design relational ✓ database tables to minimise duplication of data ✓ or data anomalies.		
	6.2.1	Add in the missing values for camp, location, created. ✓	
	6.3.3	Data redundancy ✓	
	6.3.1	The rate is not consistent with the code. ✓✓	
	6.3.2	Cannot put rate in a separate table with code ✓ (as it is fully dependent, will need to stay in primary table) but noPeople is a transitive dependency on code ✓ OR no separate table	
6.4	Insert ✓ – do not have enough information to meet requirements of structure ✓ Update ✓ – when same information needs to be updated in more than one place, ✓ Delete ✓ – by deleting one bit of information, delete too much, ✓		
6.5	Accommodation ✓ (Camp, AccomCode ✓, rate) Camps ✓ (camp ✓, location, created) Types ✓ (TypeCode, ✓ AccomType, noPeople) Codes ✓ (AccomCode ✓, TypeCode ✓) Note: can also accept noPeople in the Codes table		
	6.6.1	No data can refer to other data that does not exist ✓	
	6.6.2	Deletion of a TypeCode such as B when there are still Codes of this type in the Codes table ✓	
			[25]

QUESTION 7

SOLUTION DEVELOPMENT

7.1	Provide the algorithm which prompts the user for which accommodation type they would like to book (they may enter the ID), number of adults, number of children, and number of days, and return the number of units required, and total cost.	(12)
7.2.1	Inheritance✓ - Re-using code of existing objects in order to create similar and more specialised objects✓	
7.2.2	Accommodation method overloaded ✓- same class✓, same name ,different signatures✓ toString method overridden✓ - parent and child class✓, same name, same signature✓	
7.2.3	Information hiding✓	
7.2.4	- ✓Private✓only visible within class✓, e.g. Camp variable✓ + ✓Public ✓visible outside of class.✓ E.g. Constructor ✓ # ✓Protected✓ visible within class and package✓ e.g. addSpaces ✓	
7.3	Standard,✓Extreme✓, abnormal✓	
		[36]

61 marks

Total: 180 marks