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ST BENEDICT'S COLLEGE



SUBJECT
GRADE
EXAMINER
NAME

Information Technology
12
Mr R Engelbrecht

PAPER
DATE
MARKS
MODERATORS
DURATION

Theory Exam
July 2017
180
Cluster
3 hours

2

COGNITIVE LEVELS

LOW
ORDER

31 %

MIDDLE
ORDER

38 %

HIGH
ORDER

31 %

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. This question paper consists of 24 pages (including the extra page and front cover). Please check that your question paper is complete.
2. Read the questions carefully and make sure that you answer all parts of each question.
3. Answer ALL questions – there are no options in this paper.
4. Show all working where applicable.
5. A non-programmable calculator may be used.
6. It is in your own interest to write legibly and to present your work neatly.
7. Answer all the questions on the question paper in the spaces provided.
8. Extra paper has been included on the last page should you need it to complete any of the answers.

	Q 1	Q 2	Q 3	Q 4	Q 5	Q 6	Q 7	Total
Possible Marks	10	10	42	47	19	19	33	180
Actual Marks								

SECTION A SHORT QUESTIONS

QUESTION 1

MULTIPLE CHOICE

10 MARKS

Various options are provided as possible answers to the following questions. Circle the correct answer (A–D) for each question.

1.1. Modular design of the motherboards means the following:

- A A socket to place the CPU in on the motherboard
- B A single unit where all the hardware is fixed
- C Components on the motherboard can be interchanged with other, provided they are compatible with the motherboard
- D To plug a printer into a USB slot

1.2. Which word(s) describes a hardware component requesting attention from the CPU:

- A Serial Request
- B Interrupt
- C Data Request
- D Data Range

1.3. A mechanism for improving the time it takes to read from or write to a hard disk:

- A Disk Cache
- B Web Cache
- C Level 3 Caching
- D Level 2 Caching

1.4. Name the term for when the computer appears to run multiple programs at the same time.

- A Multiprocessing
- B Multithreading
- C Multi Cores
- D Multitasking

1.5. The following is an example of a low level programming language

- A Assembler
- B Pascal
- C Java
- D Python

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1.6. In a class, which of the following indicates information hiding of the fields/properties.

- A Public
- B Constructor
- C Private
- D Integer

1.7. Connecting two devices via Bluetooth is an example of:

- A GAN
- B LAN
- C PAN
- D WLAN

1.8. Overclocking means the following:

- A The CPU operates faster than the system clock
- B The speed of the RAM is decreased to that of the CPU
- C Software runs at a faster rate than slower hardware components such as a hard drive, and data is written to the cache
- D All the components decrease their clock multiplication factor

1.9. The use of a server to store recently cached web sites for an organisation using a network.

- A Proxy Server
- B File Server
- C Email Server
- D Internet Server

1.10. Information overload can be defined as:

- A Websites that does not conform to any form of information privacy model
- B Collaboration in forming the content of the website
- C The amount of information is overwhelming and needs to be managed
- D Search engines that store information about the user doing the search

QUESTION 2**MATCHING COLUMNS****10 MARKS**

Write down along the left side of your page only the number of the question from Column A, and next to it the correct matching capital letter from Column B, for example 2.11 T.

Write down the answer at the bottom of the question in the space provided.

Column A		Column B
2.1.	Source code compiled into object code and creates a separate file	A Client side scripting B DNS
2.2.	Protocol for converting a MAC address to an IP address	C FTP D Record E Field
2.3.	A text file that forms part of a web browser to record browsing history	F HTTP G Web 2.0
2.4.	The semantic or intelligent web	H Syntax Error I Compiler J Non-Atomic
2.5.	An error in programming where the program halts unexpectedly when executing	K Referential Integrity L Cookie
2.6.	An email protocol where the emails are retained on the server available to multiple devices	M Data Redundancy N Run time error O Interpreter
2.7.	Older protocol used to share files over the Internet	P Web 3.0 Q POP3
2.8.	A collection of fields that contains details of a specific entity in a database	R Formal Parameter S ARP T IMAP
2.9.	A parameter that is defined in a method header	U Actual parameter V Registers
2.10.	A rule in the DBMS that no record can refer to a record that does not exist	

Write answers in the table below:

2.1		2.2		2.3		2.4		2.5		2.6		2.7		2.8		2.9		2.10	
-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	-----	--	------	--

SECTION B**SYSTEM TECHNOLOGIES**

CONSIDER THE SCENARIO BELOW WHEN ANSWERING THE REST OF THIS PAPER, ESPECIALLY SECTION B AND SECTION C

Scenario:

GATOX ENGINEERS employ engineers to work on remote building sites, in different cities. They need to take photos of current structures, calculate estimations for cost analysis, and write reports that includes the photographs taken of building sites. Furthermore, the engineers need to have access to their email and access to Internet for research purposes, on the building sites.

The engineers complete their reports at their head office. There are 50 people working in the office, these people include the engineers and their personal assistants.

The company wants to purchase computer products and have narrowed the search to the following two products:

Device A	Device B
	
Extracted: http://www.gsmarena.com/apple_ipad_pro-7562.php	Extracted: https://www.cnet.com/products/dell-inspiron-mini-10-10-1-atom-z520/specs/
CPU: Dual Core 2.26 GHZ, L3 Cache	CPU: Intel Atom Z520 2.33 GHZ L1 Cache
RAM: 4GB	RAM: 4 GB DDR3 SDRAM at 1 333MHz
GPU: PowerVR Series	GPU: None
Camera: 8MP Primary, 1.2MP Secondary	Camera: 2MP
Network: Wi-Fi, Bluetooth, LTE	Network: Wi-Fi, 100/1000 Ethernet
Sensors: Fingerprint, gyroscope, compass	Sensors: None
OS: IOS	OS: Windows Vista Home Edition
Storage: 128GB SSD	Storage: 1TB HDD
Card Readers: None	Card Readers: 3 in 1
Security Protocol Wi-Fi: WEP, WPA, WPA2	Security Protocol Wi-Fi: WEP, WPA

QUESTION 3**42 MARKS**

3.1. Explain the term **Dual Core** processor.

[2]

3.2. Device B has a chipset found in traditional desktops.

3.2.1 Name the chipset component that is responsible for tasks that require the highest performance.[1]

3.2.2 Name TWO components in Device B connected to this chipset. [2]

3.3. Both devices contain cache memory in their CPU description. Explain the purpose of processor cache memory. [2]

3.4 The CPU operates in a four step cycle.

3.4.1 List the FOUR stages of the machine cycle. [4]

3.4.2 Which two of these stages **will always** be executed for every instruction? [2]

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3.4.3 Which TWO of these stages **will not always** be executed for every instruction? [2]

3.5 Device B has an Intel chipset.

3.5.1 The speed of the processor is 2.3 GHz while the speed of the RAM is 1 333 MHz. Explain why these components have different speeds. [2]

3.5.2 There are many bottlenecks in motherboard and chipset design. Explain TWO bottlenecks that can occur and how they can be resolved. [4]

3.6 Device A and B have two different storage types. Explain TWO ways that Solid State hard Drives (SSD) can be distinguished from Hard Disk Drives (HDD). [2]

3.7 Device B could make use of Virtual Memory.

3.7.1. How is virtual memory implemented? [2]

3.7.2 Name ONE negative implication of using Virtual Memory [1]

3.8. Device A includes a GPU to the mobile device.

3.8.1. Explain the function of a GPU (do not expand the acronym). [2]

3.8.2. How would this component enhance the mobile device? [2]

3.9 The engineers need to choose between Device A and Device B.

3.9.1 Which device do you think that an engineer should choose considering the scenario? [1]

3.9.2. Give THREE reasons for your answer in 3.9.1 by referring to the components in the device. [3]

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3.10 The Notebook uses a desktop operating system. Name TWO other types of desktop operating systems excluding any Windows operating systems. [2]

3.11 Name TWO utility applications are available on any mobile device. [2]

3.12 An IT software design company has offered to write an application (program) to assist the engineers on the jobs they perform. This application will use SAAS as part of the software.

3.12.1. Explain to the term SAAS is (do not expand the acronym). [2]

3.12.2. List TWO examples of SaaS that the company could use considering the scenario.[2]

SECTION C INTERNET AND COMMUNICATION TECHNOLOGIES

QUESTION 4

47 MARKS

4.1. GATOX ENGINEERS need to connect all devices in their head office with a local area network (LAN) and the Internet.

- 4.1.1. The choice of network connections inside the building is between **cables** and **Wi-Fi**. Why would a Wi-Fi connection be more suitable? Justify your answer by referring to the scenario. [2]

- 4.1.2. What additional device would you need to connect to the Wi-Fi network to the Internet? [1]

- 4.1.3. Device A has LTE technology. What is LTE? Do not expand the acronym. [2]

4.2. If GATOX ENGINEERS decide to build a network consisting of both cabled network and Wi-Fi, what suggestions would you make in respect of the following:

- 4.2.1. Which topology would you suggest for the cabled network, and give TWO reasons why you would suggest this topology? [3]

4.2.2. The cabled network requires a major component to connect all cabled devices together. Name this component. [1]

4.2.3. Fibre cable is expensive. Name ONE other disadvantage (not cost) of using fibre cabling. [1]

4.2.4. The engineers located at remote building sites have heard of a Wireless Mesh Network.

4.2.4.1. What is a Wireless Mesh Network? [2]

4.2.4.2. Would it be possible to use a Wireless Mesh Network to connect the remote sites to the LAN at head office? Justify your answer. [2]

4.3. In setting up an Internet connection to the office, we would have to consider a router or a gateway.

4.3.1 Define a router. [2]

4.3.2 Define a gateway. [2]

- 4.4 GATOX ENGINEERS can use different solutions to connect the office to the Internet. The engineers and their personal assistants transmit pictures and reports. Why would ADSL be a good solution? Give TWO reasons for your answer considering the scenario. [2]

- 4.5 To connect to the Internet, data would need to be sent according to protocols.

- 4.5.1. Explain to management what a protocol is. [2]

- 4.5.2 Name the protocol that we use to communicate on the Internet. [1]

- 4.6 Device A and Device B both offer wireless connectivity. There is one type of connectivity that is the same on both devices and one type that is not the same.

- 4.6.1 Based on the scenario, and considering the network connectivity options, which device would you choose? [1]

- 4.6.2 Give TWO reasons for your choice in 4.6.1. [2]

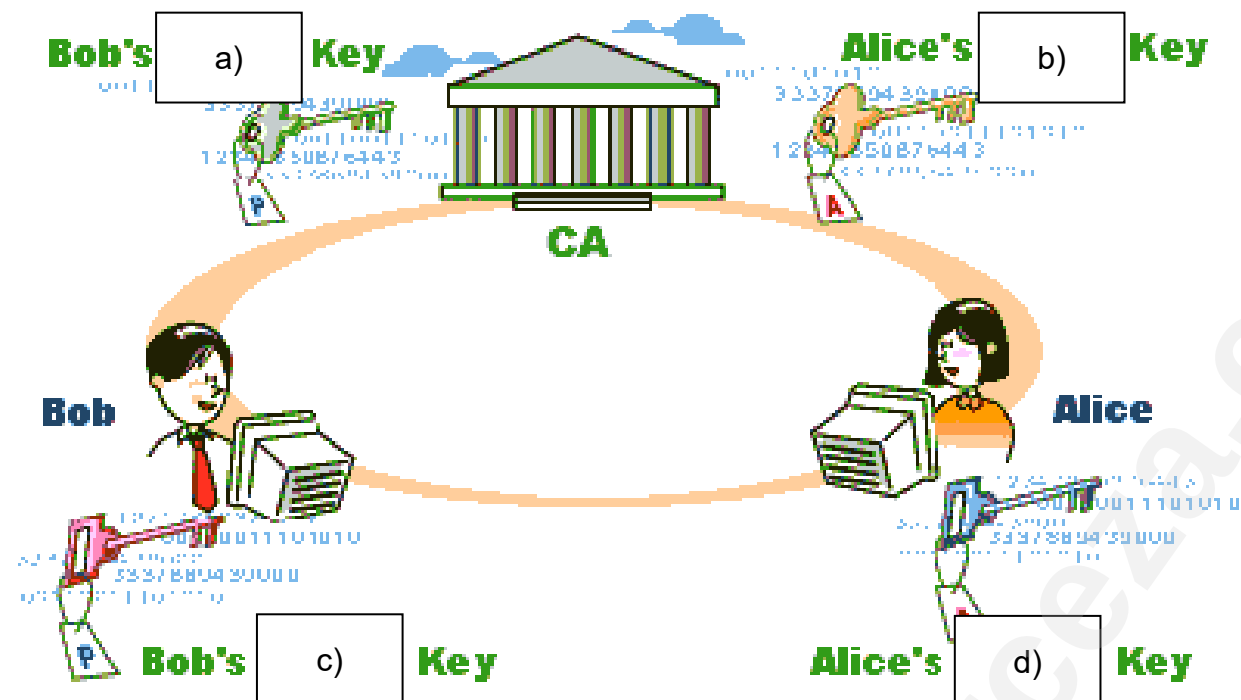
4.7 GATOX ENGINEERS want to save the photos and reports in the cloud.

4.7.1 Name TWO risks that the engineers need to consider when storing data in the cloud. [2]

4.7.2 Which Internet protocol must they use to transmit data in a safe and secure manner? Give ONE reason for your answer. [2]

4.8 The use of encryption is important if GATOX ENGINEERS want to secure the transmission of data over the Internet.

4.8.1 Label the following diagram a) – d) to illustrate how public and private key encryption works. [4]



a)	
b)	
c)	
d)	

4.8.2 The engineers at GATOX ENGINEERS feels that the purchase of a digital certificate is unnecessary; give TWO reasons why this is a mistake. [2]

4.9 One of the engineers is in a remote area with low Internet connectivity. He needs to show the staff at the remote site a video. He could stream or download the video.

4.9.1 Define the terms streaming and downloading. [2]

Streaming
Downloading

4.9.2 Which of the options streaming or downloading should he use choose considering the scenario? Give ONE reason for your answer. [2]

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- 4.9.3 Someone mentioned Bit Torrenting to the engineers as a method of getting the video file at the remote site as an alternative to the methods mentioned in 4.9.1. Would using Bit Torrenting be a good option for obtaining the video file? Give ONE reason for your answer considering the scenario. [2]

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4.10 One of the engineers at GATOX ENGINEERS needs to connect to the LAN at head office to access a file on the local server. The engineer can either use a VPN or Remote Access to connect to the LAN from the remote site.

4.10.1 Which type of connection would you use? Justify your answer by describing the function of each connection method in this scenario. [5]

SECTION D SOCIAL IMPLICATIONS

QUESTION 5 19 MARKS

5.1. Managers in the office would like to educate their staff with regard to “fake news” found on social media sites.

5.1.1. How could Search Engine Optimisation (SEO) be used to ensure that fake news is prioritised in the Search Engine? Name and describe TWO methods. [4]

- 5.1.2 On Facebook, one of the engineers reads that a building built by GATOX ENGINEERS has fallen down in Dubai. Describe THREE ways that can be used to identify if this is fake news. [3]

- 5.2 Managers in the office also speak to their staff about the dangers of social networking and social engineering.

- 5.2.1 Which of the two are more dangerous? Justify your answer. [2]

- 5.3 GATOX ENGINEERS experience a loss of their data on their local file servers. They employ a company specialising in detecting weaknesses in the computer networks.

- 5.3.1 Would a black hat hacker or white hat hacker be used to expose the weaknesses in the GATOX computer system? Justify your answer. [2]

- 5.3.2 How could a Denial of Service attack affect GATOX ENGINEERS? [2]

5.4. One of the staff members at GATOX ENGINEERS admitted to deleting the files relating to customers and their building designs and emailing files to a company in competition to GATOX ENGINEERS.

5.4.1. Would the management at GATOX ENGINEERS have the right to search through the emails of the staff member? Give TWO reasons for your answer. [3]

5.4.2 Would encrypting the files have prevented the staff member from deleting the files? Justify your answer. [3]

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SECTION E DATA AND INFORMATION MANAGEMENT AND SOLUTION DEVELOPMENT

QUESTION 6

DATABASES

19 MARKS

Background:

The customers of GATOX ENGINEERS own different types of buildings (residential or commercial) all over the country. A customer can own more than one building and one building can be owned by more than one customer. The GPS co-ordinates, type of building, number of stories and address are included in the table called **tblCustomers**.

Key: C = Commercial Warehouse

R = Residential House

tblCustomers

CustID	Customer Name	PropID	Property GPS Coords	Type	Residential/ Commercial	Number Stories	Address
001	Guy Prop	GP001	26.204158 S 28.047312 E	C	Commercial	5	14 Joubert Street JHB
001	Guy Prop	GP002	26.204156 S 28.047322 E	C	Commercial	6	55 Fox Str JHB
002	Glen Sec	GP002	26.204156 S 28.047322 E	C	Commercial	6	55 Fox Str JHB
002	Glen Sec	FS001	29.08512 S 26.159634 E	C	Commercial	2	34 Clyde Ave BFN
003	Silver Star	WC001	33.924977 S 26.159622 E	R	Residential	2	3 Summer Place CT
003	Silver Star	GP003	26.204160 S 28.047322 E	C	Commercial	1	134 Jorrisen Str JHB
005	Anderson Clay	WC001	33.924977 S 26.159622 E	R	Residential	2	3 Summer Place CT
005	Anderson Clay	GP004	26.204199 S 28.047334 E	R	Residential	3	56 Grayston Ave JHB

6.1. This database is poorly designed which will lead to errors and anomalies in the database.

6.1.1. Give an example of each type of anomaly from the table above. [3]

Update:
Insert:
Delete:

6.2 Provide an example of derived data using the table. [2]

6.3 The field **Property GPS Coords** could be considered non-atomic data. Do you think the field should be split into two separate fields? Justify your answer. [2]

6.4 Normalise the table to Third Normal Form (3NF). When writing the relation make use of Relational Notation: TableName (Field01, Field02, Field03 ...). Remember to underline the primary keys. Remove any fields you consider to be unnecessary. [8]

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6.5 The Architect’s name is missing from the table. Note that an architect may design more than one building, but not all the buildings are designed by the same architect. Each building will have only one architect listed as the designer.
How would you expand the solution to include this field? Could you add this field to the existing table or would you need to add a new table? Give a reason for your answer. [2]

6.6 When using SQL to query a database, a LEFT JOIN and an INNER JOIN are often confused when combining tables. Explain the difference between these two types of joins. [2]

QUESTION 7

OOP

33 MARKS

GATOX ENGINEERS go out to building sites and work out cost estimates, give building advice, research building techniques and write reports. The customer is billed according to the time the engineer spent on site.

7.1 Write an algorithm that will determine the cost to bill a customer for the work done by an engineer for a month. The input of data is the hourly rate of pay for the engineer, followed by a sequence of numbers representing the number of hours worked for each day. Input will stop when 555 for hours worked is entered. An engineer can only work 8 hours a day, so any number larger than 8 must be charged overtime which is 1.5 times greater than the hourly rate.

Input example:

400.00, 5, 9, 7, 1, 2, 7, 10, 555.

The output should include the total normal hours worked (excluding 555) multiplied by the hourly rate, the total number of overtime hours multiplied by the hourly rate x 1.5, the number of days entered and the calculated amount to charge the customer.

Output using the above data:

Total hours at normal time = 38 x 400.00 = 15200.00
Overtime hours at overtime rate = 3 x 600.00 = 1800.00
Total pay = 17000.00
Number of days worked = 7

[14]

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7.2 A class has been created to store the information of an invoice.

Invoice Class
Properties - String employeeNumber - String clientNumber - double monthlyCost - final double VAT = 14
Methods + setEmployeeNumber(String e) + getEmployeeNumber() : String + addVAT() : double + toString() : String

7.2.1 Write down an accessor and mutator method using the class diagram. [2]

Accessor:
Mutator:

7.2.2 Explain why the VAT field is declared as “final”. [2]

7.2.3 The class is missing the constructor method. Write down the method header of the parameterised constructor method. [4]

7.2.4 The **EmployeeNumber** field consists of six characters. The first two consist of the employees initials, and the next three must be digits with the last being an E for an engineer. For example AB042E, JK201E.

Write a method in Java to determine if the **EmployeeNumber** is valid. The first two characters should be letters, the next three should be numbers and the last character should be an 'E'. The method should terminate as soon as the **EmployeeNumber** is determined to be invalid.

The method is called by: `boolean ans = checkEmployee(String empNo);` [8]

7.3 An array is created to store multiple Invoice objects with the following declaration:

```
Invoice [] iArr = new Invoice[100]
```

Would it be suitable to store the VAT field in each Invoice class? Justify your answer. [3]

EXTRA SPACE FOR ANSWERS. PLEASE CLEARLY INDICATE THE QUESTION NUMBER OF YOUR ANSWER.

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