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ST BENEDICT'S COLLEGE



SUBJECT	Information Technology	DATE	July 2016
GRADE	12	MARKS	180
EXAMINER	Mrs Kench	MODERATOR	
NAME		DURATION	3 hours
CLASS			

COGNITIVE LEVELS

LOW ORDER

30 %

MIDDLE
ORDER

41 %

HIGH ORDER

29 %

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. This question paper consists of 15 pages. 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. Non-programmable calculators may be used.
6. Number your answers exactly as the sub-questions are numbered.
7. Start each answer to each question on a **new page**.
8. Please leave a **line open** between sub-questions.
9. 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
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			180

SECTION A

SHORT QUESTIONS

QUESTION 1

MULTIPLE CHOICE

10 MARKS

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 Google Docs is an example of (1)
- A SaaS
 - B PaaS
 - C TaaS
 - D FaaS
- 1.2 Which of the following factors does NOT influence the efficiency of communication between the CPU and the peripherals (1)
- A Data conversion
 - B Protocol conversion
 - C Analog conversion
 - D Voltage conversion
- 1.3 The specification 802.11 b/g/n in an advertisement for a computer means that the computer... (1)
- A Has a Thunderbolt port for high speed data transfer
 - B Can be connected to a cabled network
 - C Is fitted with a solid state drive
 - D Has built-in support for Wi-Fi
- 1.4 Which of the following is NOT true regarding Bit Torrents (1)
- A Peer to peer communication protocol
 - B Once a peer has the complete file, it becomes a seed that other people can use
 - C Uses HTTP as its transport protocol
 - D The central server provides access to the torrent file.
- 1.5 Hardware or software that monitors the traffic between a computer and the Internet, to safeguard against breaches in security. (1)
- A Firewire
 - B Proxy server
 - C Firewall
 - D Gateway

- 1.6 The least effective solution to improve the overall performance of an older computer is to (1)
- A Defragment the hard drive regularly
 - B Uninstall seldom used programs
 - C Upgrade to an LED monitor with a faster response time
 - D Add more RAM
- 1.7 Which of the following compression standards is Lossless? (1)
- A WAV
 - B MP3
 - C MPEG-4
 - D JPEG
- 1.8 A field whose value is the same as that of the same field of another record for valid reasons. (1)
- A dependent data
 - B derived data
 - C redundant data
 - D duplicate data
- 1.9 The value passed when calling a method. For example the 5 in the method call myMethod(5). (1)
- A formal parameter
 - B actual parameter
 - C implicit parameter
 - D typed parameter
- 1.10 Which is NOT an advantage of a Relational database (1)
- A Concurrency control
 - B Physical data dependence
 - C Scalability
 - D Query optimisation

QUESTION 2

TERMINOLOGY

10 MARKS

Give the correct term for the following descriptions:

- 2.1 A computer design philosophy which incorporates a variety of reusable stand-alone components, thereby facilitating upgrades and maintenance. (1)
- 2.2 The type of memory that stores the user and computer settings that can be updated or changed. (1)
- 2.3 Security based on identification of unique physical characteristics of a person such as fingerprints and retina. (1)
- 2.4 Network of illegally, remotely controlled PCs (1)

- 2.5 A signal sent to the CPU indicating that a device or process needs attention. (1)
- 2.6 A form of malware that attaches itself to a file or executable program, thereby enabling it to spread between computers. (1)
- 2.7 A type of dependency where a field's value is dependent on part of a primary-key field. (1)
- 2.8 Data where each value in a field to only store a single data item. (1)
- 2.9 A programming language's ability to process objects differently depending on their data type or class. (1)
- 2.10 Type of method that does not return a value. (1)

SCENARIO

Latest Sightings was established in 2012 by schoolboy Nadav Ossendryver. As an obsessive Kruger Park visitor, Nadav's favourite pastime was asking his parents to flag down passing motorists to ask them what they had seen. Eventually they tired of this hobby and began to say no. Nadav looked to technology to solve his problem. He established Latest Sightings and from there it quite literally exploded!

Latest Sightings is an app platform that allows visitors who are currently on safari, be they rangers or tourists, to report the animals and events that they are seeing - live.

They report their location, time and sighting to Latest Sightings, which in turn broadcasts these 'tings' (a reported sighting) to the smartphone app.

This app currently has 200,000+ people in the community.

<https://www.latestsightings.com> accessed on 4th May 2016



SECTION B

SYSTEM TECHNOLOGIES

QUESTION 3

HARDWARE AND SOFTWARE

44 MARKS

The game rangers at Kruger Park have a facility with computers. The computers are outdated and need upgrading. The game rangers are not very knowledgeable about computers. Assist them by answering the questions listed below.

- 3.1 A typical computer will have RAM and ROM.
 - 3.1.1 Describe TWO differences between RAM and ROM. (4)
 - 3.1.2 Name ONE similarity between RAM and ROM. (1)
 - 3.1.3 RAM may be either dynamic RAM(DRAM) or static RAM(SRAM). Explain TWO the differences between these types of RAM. (2)
- 3.2 Secondary storage can be magnetic, optical or solid state.
 - 3.2.1 For each type of storage identify one feature of the basic internal operation which is different from that of the other two types. (3)
 - 3.2.2 For two of the three types of storage identify one similarity in the basic internal operation. (2)

- 3.3 The Rangers want new computers with an Intel i7 CPU. The i7 is a quad-core hyperthreading 64 bit processor with the following features:
- 4.2 GHz core speed
 - 8 MB cache memory
- 3.3.1 How many CPU's does a quad core chip have? (1)
- 3.3.2 Discuss ONE practical example of how hyperthreading is applied by a software application. (2)
- 3.3.3 Explain how cache memory works. (2)
- 3.3.4 One of the Rangers asks the following questions:
'If cache is so important, why does the suggested computer only have 8mb of cache?'
Give TWO reasons why cache memory in a computer is limited. (2)
- 3.3.5 The i7 processor mentioned is a 64 bit processor. Name TWO components/busses that connect to the North Bridge that will be affected by this fact. Justify your answer. (4)
- 3.4 A cellphone company offered to supply smartphones to the Rangers at the Kruger Park, who will also make use of the Latest Sighting App developed by Nadav Ossendryver.
- 3.4.1 Name ONE operating system developed exclusively for smart phones. (1)
- 3.4.2 Describe TWO responsibilities of an operating system regarding the management of memory. (2)
- 3.4.3 High level programming languages are commonly used to develop software applications.
Discuss TWO advantages for the programmer who uses a high level language instead of a low level language. (2)
- 3.4.4 Nadav Ossendryver decided to distribute the Latest Sighting app as freeware software instead of as proprietary software.
Identify ONE difference (not the same) and ONE similarity (the same) between these two types of software. (2)
- 3.4.5 There is no immediate financial benefit for Nadav Ossendryver if he distributes the Latest Sighting app as freeware software.
Provide explanations of TWO ways in which Nadav could benefit financially, in the long run from distributing the app as freeware software. (4)
- 3.4.6 State TWO challenges faced by programmers when they develop software applications for smartphone/mobile devices. (2)
- 3.5 A programmer can choose to use an interpreter or a compiler.
- 3.5.1 Discuss ONE advantage and ONE disadvantage of an interpreter compared to a compiler. (2)
- 3.5.2 Explain ONE feature that makes Java as a programming language, more portable than Delphi. (2)
- 3.6 Nadav Ossendryver would like to make use of cloud storage to store administrative data for his company.
- 3.6.1 Explain what is meant by cloud storage. (2)

- 3.6.2 Motivate why it could be problematic for Nadav if he only uses the cloud to store his administrative data.

State TWO problems that may occur as part of your motivation. (2)

SECTION C COMMUNICATION AND INTERNET TECHNOLOGIES

QUESTION 4 NETWORKS AND THE INTERNET 37 MARKS

The Kruger Park currently has a number of buildings on a single site that is used as a rest stop for visitors and as office spaces for the employees of the park. It has been decided that all of the computer work stations in the different buildings need to be networked.

- 4.1 One option they are considering is to use cabling for the network and to install it themselves.
- 4.1.1 Name the TWO types of cabling that they might consider. (2)
- 4.1.2 Explain TWO factors, other than cost, that they need to consider when choosing suitable cabling. (4)
- 4.1.3 What network topology would you recommend for connecting the computers in each building? Give TWO reasons for your choice. (3)
- 4.2 Another option they are considering is to use wireless technology for at least a part of the network.
- 4.2.1 Identify ONE advantage other than cost of using wireless rather than a cabled network. (1)
- 4.2.2 A password is required in order to access the wireless network. Why does having a password not guarantee the safety of the wireless network? (2)
- 4.2.3 One of the devices that could be used to connect to a wireless network would be a smartphone. Name and describe TWO different wireless methods used by a smartphone for transferring data. (4)
- 4.2.4 Give TWO ways how employees can access the company network from outside the Kruger Park. (2)
- 4.3 The Kruger park currently has no 4G/LTE coverage, the only available coverage is 3G.
- 4.3.1 What advantage would 4G coverage have over 3G for visitors to the Kruger Park? (1)
- 4.3.2 Give ONE reason why a 3G connection may not be the most suitable way for employees of the park to connect to the Internet. (1)
- 4.3.3 Give TWO alternate ways (other than 4G) the employees could use to connect to the Internet over 3G. (2)
- 4.4 The Latest Sighting app makes use of your mobile device's GPS (Global Positioning System) functionality.
- 4.4.1 Give a brief description of how GPS works. (2)
- 4.4.2 Discuss TWO ways in which the use of the Latest Sighting app could be beneficial to the Rangers at the park. (2)
- 4.5 The Rangers have been encouraged to network with the school community of South Africa via video conferencing and social media services.
- 4.5.1 Name the protocol used for video conferencing. (1)

- 4.5.2 Discuss TWO challenges of video conferencing that the Rangers may face in South Africa. (2)
- 4.5.3 Discuss ONE way in which the Rangers could make use of social media services to connect with school communities. You will need to include an example of a social media service in your description. (2)
- 4.6 The administration offices requested that SSL should be implemented as an encryption protocol.
- 4.6.1 How will the park's website address (<http://www.krugerpark.co.za>) change once SSL has been implemented? (1)
- 4.6.2 What key is required to be able to decrypt an SSL-encrypted email? (1)
- 4.6.3 Discuss TWO activities that the Kruger park website may offer that will need to make use of SSL encryption. (4)

SECTION D

SOCIAL IMPLICATIONS

QUESTION 5

SOCIAL IMPLICATIONS

18 MARKS

On the First Sightings application, any registered user can upload a ting. The following information is captured:

- User
- Date and Time
- Location (via device GPS)
- Visibility rating
- Traffic rating
- Type of animal
- What it is doing (from a predetermined list, e.g. walking, stationary, in a tree).
- If possible, a photo of the animal
- Other animals in the vicinity
- Notes

- 5.1 The application uses your GPS on your device to determine your location.
- 5.1.1 Discuss ONE advantage of having this information available to the application. (2)
- 5.1.2 Discuss ONE disadvantage of having this information available to the application. (2)
- 5.2 Should tings regarding the whereabouts of a Rhino be prevented? Provide TWO reasons. (4)
- 5.3 What is Social Engineering? (2)
- 5.4 The web version of Latest Sightings now includes a feature called Live Drives, which enables school children to take virtual game drives. Name TWO ways in which ICTs can be used in this scenario. (2)
- 5.5 A dilemma which faces many game rangers is what to do about schooling once their children reach school-going age, as often they are based in remote locations which do not have adequate schooling facilities. A new initiative has been started in the Lowveld, which facilitates home-schooling with project based learning for children of rangers. Learners obtain notes online and skype teachers and each other.
- 5.5.1 Explain how a wiki would be useful in this in this scenario. (2)

5.5.2 An AUP is drawn up for learners to communicate. Provide TWO items to be included. (2)

5.5.3 What practical issues should you consider when setting up remote learning units? Justify your answer. (2)

SECTION E DATA, INFORMATION AND SOLUTION DEVELOPMENT

QUESTION 6

NORMALISATION

25 MARKS

Latest Sightings also has a link to available accommodation in the various parks, and updates any things made by visitors to the information boards at their respective lodges. Below is information on available accommodation at a few of the Kruger Park's well-known rest camps. At a camp, there may be different qualities (age of building, types of finishings, etc.) of an accommodation type, so each gets its own Accommodation Code and rate (the newer and better the accommodation, the more you pay for it!) The rate is a DAILY rate, per accommodation type i.e. to rent a campsite at Berg-en-dal for 2 nights (Accommodation Code CK6Z) will cost you $2 * R275 = R550$ (and 2 people can stay on the campsite)

Camp	Location	Created	Type	Accommodation Type	Number of People	Accommodation Code	Rate(R)
Berg-en-dal	Matjulu Spruit	1984	B	Bungalow	2	BA3U	1250
			B	Bungalow	2	BA3UZ	1250
			B	Bungalow	2	BA3	1150
			CK	Camp Site	2	CK6P	275
			F	Family Cottage	4	FA6Z	2150
Pretorius-kop	9km from Numbi Gate	1928	B	Bungalow	2	BD2	1235
			B	Bungalow	2	BG4	1085
			CK	Camp Site	2	CK6P	275
			E	Hut	3	EB2	550
			E	Hut	3	ES2	375
			F	Family Cottage	4	FF6D	2150
Satara	68km from Orpen Gate	1928	B	Bungalow	2	BD2V	1295
			B	Bungalow	2	BD2	1255
			B	Bungalow	2	BD3B	1255
			CK	Camp Site	2	CK6P	275
			CK	Camp site	2	CK6	245
Skakuza	Southern bank of Sabie River	1898	B	Bungalow	2	BD2	1220
			B	Bungalow	2	BD3	1220
			B	Bungalow	2	BE2	1120
			L	Semi-Luxury Bungalow	5	LB3	1440
Crocodile Bridge	Northern bank of Crocodile River	1929	CT	Safari tent	4	CTT4	550

<https://www.sanparks.org/parks/kruger/camps/pretoriuskop/tourism/availability.php> accessed 15 June 2016

- 6.1 You have been asked to normalise the data above. What does this mean? (2)
- 6.2 In order to select your primary key, you will need to resolve repeating groups.
 - 6.2.1 How will you do this? (1)
 - 6.2.2 What issue will this introduce? (1)
- 6.3 When considering database design, one has to be careful of what assumptions one makes.
 - 6.3.1 Why is code to rate not a transitive dependency (look at the code BD2)? (2)
 - 6.3.2 How will this impact your database design? (2)
- 6.4 You select Camp plus Accommodation Code as your composite primary key. Describe the THREE anomalies that could occur if you do not normalise your data further. (6)
- 6.5 Write the table above in Third Normal Form. Use the notation of the table name, followed by the field name(s) in brackets, with primary key underlined. Use as your primary key for the data given, the composite key of Camp and Accommodation Code. (9)
- 6.6 Even once normalised, there are actions that could cause data issues in your database, such as “orphaned” records.
 - 6.6.1 What is referential integrity? (1)
 - 6.6.2 Give an example of an action, from the data above, assuming that you have normalized your data, that could potentially result in this issue, if not prevented by your DBMS. (1)

QUESTION 7

SOLUTION DEVELOPMENT

36 MARKS

A useful extension of the Latest Sightings application would be to allow online booking requests.

The table below provides additional information for the cost of a unit. Note that the accommodation base rate is for a specified number of people, with an additional fee being charged for extra adults or children. So for example:

- If a family of 4 (2 adults and 2 children) is making a booking for a campsite for 5 days, since base rate for camps is for 2 people this covers the adults. The 2 children need to pay 2x the additional child rate for 5 days producing the formula: $5 * (275 + (2 * 38)) = R1755.00$
- If a group comprising of 10 adults and 6 children (16 in total) is booking family cottages (which sleep 6), they would need 3 family cottages (16 Divided by 6 is 2 remainder 4 which rounds to 3). In each, 4 people are covered by the base rate, so $3 * 4 = 12$ people. Always cover the adults first (as more expensive), so need to pay additional for 4 of the children, i.e. $3 * 2150 + 4 * 190 = R7210$ per day.

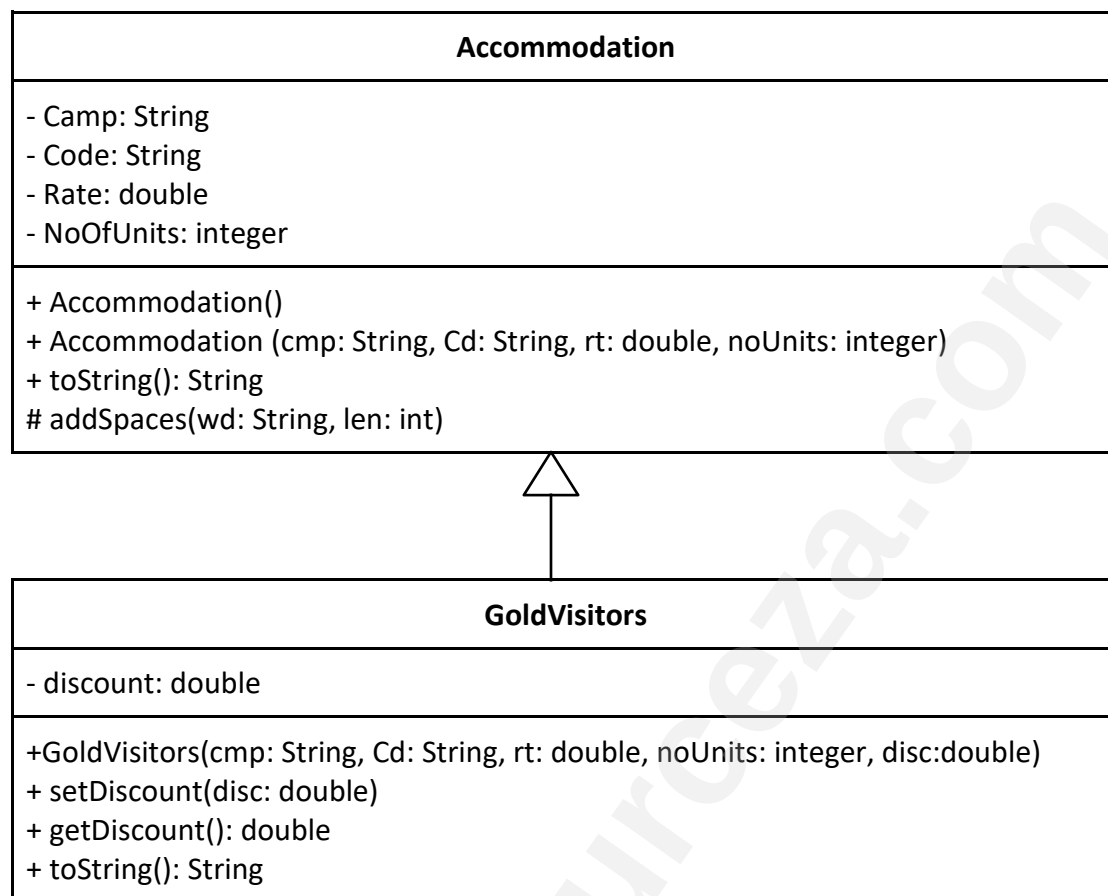
ID	Accommodation Type	Base Rate	Base Rate (no. people)	Max (no. beds/people)	Additional Adult	Additional Child
1	Camp Site (CK6P)	R275.00	2	6	R 76.00	R 38.00
2	Hut (ES2)	R375.00	2	2	R 150.00	R 75.00
3	Hut (EB5)	R550.00	2	5	R 150.00	R 75.00
4	Bungalow (BG2D)	R1085.00	2	2	R 220.00	R 110.00
5	Bungalow (BG4)	R1085.00	2	4	R 220.00	R 110.00
6	Bungalow (FU4D)	R2150.00	4	4	R 220.00	R 110.00
7	Family Cottage (FF6D)	R2150.00	4	6	R 380.00	R 190.00
8	Family Cottage (FF6DB)	R2150.00	4	6	R 380.00	R 190.00

You may make the following assumptions:

- The rate is per day.
- Anyone under the age of 18 is considered a child.
- A separate booking is made for each accommodation type, per period (i.e. a single booking will not book multiple types of units).
- The base rate can cover adults or children (i.e. if 1 parent and child, no additional charge), will always cover adults first.
- You will fill up one unit before requiring another.
- There are multiples of each unit type available to book (you do not need to check availability).
- You are able to look up the base rate, base number, max number, additional adult and child rates from the ID.

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 An Accommodation class has already been created and is shown below. When you develop your booking application, you decide to extend the Accommodation class to cater for a loyalty program, which provides GoldVisitors with a discounted rate per accommodation camp and code.



- 7.2.1 Name and describe which fundamental idea or programming implementation that OOP offers, is being demonstrated above? (2)
- 7.2.2 Name and explain the differences between the two Accommodation methods. (3)
- 7.2.3 Both classes have a toString method. Explain why they have the same method signature and the significance of this design. (3)
- 7.2.4 What OOP principle are the accessor and mutator methods used to implement? (1)
- 7.2.5 Name and describe the THREE possible access modifiers, providing the symbol, name, description and an example of each from the class diagram above. (12)
- 7.3 What THREE types of data should you use to test your new application? (3)