higher education & training

Department:
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REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

SYSTEM ANALYSIS AND DESIGN
NQF LEVEL 4

(10041004)

1 December 2020 (X-paper)
09:00–12:00

Calculators may be used.

This question paper consists of 18 pages.

171Q1N2001

TIME: 3 HOURS
MARKS: 200

INSTRUCTIONS AND INFORMATION

1. Answer all the questions.
2. Read all the questions carefully.
3. Number the answers according to the numbering system used in this question paper.
4. Start each section on a new page.
5. Use only a black or blue pen.
6. Write neatly and legibly.

SECTION A

QUESTION 1

1.1 Various options are given as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question number (1.1.1–1.1.10) in the ANSWER BOOK.

1.1.1 Which of the following statements correctly describe a use case diagram?

i Simplest representation of a user's interaction with a system
ii Starts with a request from the system to an actor
iii Models the functionality of a system using actors and use cases
iv Written from the programmer's point of view

A i, ii
B i, iii
C i, iii, iv
D i, iv

1.1.2 Which of the following should be avoided when designing a user interface?

i Bright colours
ii Limited functionality for users to customise the interface
iii Uncluttered layout
iv Consulting with users

A i, ii
B i, iii
C i, iii, iv
D i, iv

1.1.3 Which of the following statements about human-computer interaction principles are correct?

i Provide shortcuts for frequently used items.
ii Provide informative feedback.
iii Always use button controls to create a menu.
iv Allow for easy reversal of actions.

A i
B i, ii, iv
C iii and iv
D i and iv

1.1.4 Reports that are not predefined by a programmer, but are designed as needed, are called …reports.

A one-time
B quick and dirty
C business
D ad hoc

1.1.5 The fraudulent process in which a person attempts to obtain information used for authentication by posing as someone who needs that information is known as …

A mining.
B phishing.
C hunting.
D doxing.

1.1.6 The major advantage of screen output versus printed output after it has been generated is that screen output …

A can be updated dynamically
B is more user friendly
C has more information
D is more secure

1.1.7 … testing is a non-functional test where the performance of a system is measured in terms of its ability to scale up or down.

A Integration
B Load
C Scalability
D Stress

1.1.8 A/An … best describes what a person sees in an application such as the buttons, textboxes and radio buttons.

A user interface
B system interface
C integrated development environment
D system structure

1.1.9 A … can provide automated input into a system.

A keyboard
B mouse
C radio frequency identification (RFID) tag
D touchpad

1.1.10 The … methodology is intended to improve software quality and responsiveness to changing requirements.

A agile
B RAD
C waterfall
D object-oriented

(10 × 1) (10)

1.2 Indicate whether the following statements are TRUE or FALSE by writing only 'True' or 'False' next to the question number (1.2.1–1.2.10) in the ANSWER BOOK.

1.2.1 Checkboxes are appropriate to present a set of related choices where only one of the choices can be selected at a time.

1.2.2 The class diagram is the main building block of object-oriented modelling.

1.2.3 Unified modelling language cannot be used to visually represent a system.

1.2.4 Questionnaires allow a system analyst to determine the attitudes, behaviours and actions of system users.

1.2.5 Information-security professionals recommend that passwords should be changed frequently.

1.2.6 An interviewer is also known as a respondent.

1.2.7 Transcription is the process of representing information in a different way, but without changing the information in any way.

1.2.8 Agile software development encourages slow response to change.

1.2.9 SCRUM is a framework for the iterative development of complex products, particularly software.

1.2.10 Malware is an example of an external security threat.

(10 × 1) (10)

1.3 Choose an item from COLUMN B that matches a description in COLUMN A. Write only the letter (A–S) next to the question number (1.3.1–1.3.10) in the ANSWER BOOK.

COLUMN A		COLUMN B	
1.3.1	Methodology that involves end users in design and development of a system	A	system requirements specification
1.3.2	Method of testing the internal structure or working of a program	B	report
1.3.3	Describes sequence of actions that provide something of measurable value to an actor and is drawn as a horizontal ellipse	C	viable
		D	UML
		E	RAD
1.3.4	Switching from an old information system to a new information system	F	JAD
1.3.5	General-purpose, developmental modelling language consisting of an integrated set of diagrams that provides a standard way for system and software developers to visualise the design of a system	G	process flow
		H	white-box testing
		I	terminator
		J	connector
1.3.6	Document that presents information in an organised format	K	use case
1.3.7	Able to work as intended and succeed financially	L	GUI
		M	HCI
1.3.8	Unobtrusive method of gathering information	N	waterfall
1.3.9	One of the implementations of the agile methodology	O	interview
		P	conversion
1.3.10	Symbol representing the start or end point of a system	Q	observation
		R	SCRUM
		S	attribute

(10 × 1) (10)

1.4 Choose the correct term from those in brackets. Write only the answer next to the question number (1.4.1–1.4.10) in the ANSWER BOOK.

1.4.1 System analysis involves the creation of (logical/physical) models.

1.4.2 Before gathering detailed information about a system, an analyst must identify (stakeholders/programmers).

1.4.3 An (interview/observation) can usually be completed in one comprehensive session.

1.4.4 A (state-machine/systems-sequence) diagram is used to illustrate the behaviour of a software system.

1.4.5 As a professional in the workplace, distributing chain letters is an (acceptable/unacceptable) practice.

1.4.6 (Functional/Implementation) requirements describe what the system is required to do.

1.4.7 A data-flow diagram is a schematic representation of some aspect of a system and is an example of a (logical/physical) model.

1.4.8 A (strong/weak) entity has insufficient attributes to form a primary key.

1.4.9 A (graphical user/haptic) interface allows a human to interact with a computer through bodily sensations and bodily movements.

1.4.10 (Interviews/Questionnaires) can be useful in information gathering when users are distributed over a wide geographical area.

(10 × 1) (10)
[40]

TOTAL SECTION A: 40

SECTION B

QUESTION 2

2.1 Read the following snippet and answer the questions.

Software piracy in the South African corporate sector

The Software Alliance, also known as BSA, is a trade group established by the Microsoft Corporation in 1988. It represents several the world's largest software developers and is a member of the International Intellectual Property Alliance. According to the Software Alliance the most common types of software piracy are intellectual property theft and software licensing violations. End users can report unlicensed software use directly and confidentially to BSA through www.nopiracy.org. South African companies paid almost R5,2 million in damages for using unlicensed copyrighted software in 2017 – up from R3,6 million in 2016.

[Adapted from: *https:// businesstech.co.za/*]

2.1.1 Which organisation is responsible for auditing other companies in order to take legal action against software licensing infringements? (1)

2.1.2 Differentiate between each of the following terms:

(a) Copyright

(b) Intellectual property

(2 × 2) (4)

2.1.3 Give ONE reason why organisations might use pirated software. (2)

2.1.4 Briefly explain how to report the usage of pirated software. (1)

2.1.5 Give TWO potential consequences if an organisation uses pirated software. (2)

2.2 Read the following snippet and answer the questions.

Department of Home Affairs advances identification and verification systems

The Department of Home Affairs says its newly launched automated biometric identification system (ABIS) will help in the fight against crime in the country. The ABIS project started in January 2016 and will be rolled out in phases over a five-year period with the pilot phase expected to begin in 2019. The system is expected to cost the country R200 million (R200 000 000). ABIS is a modern IT system designed to be run as a critical service without interruptions. The system uses facial recognition to identify individuals, which minister Malusi Gigaba said will serve as a single source for biometric authentication of local citizens and noncitizens across state institutions and the private sector. This modern IT system will integrate with other relevant systems, inside and outside Home Affairs, to allow for one holistic view of the status of clients as the current Home Affairs National Information System (HANIS) has reached end of life and end of support since 2014.

HANIS software could only run on the specific (product locked) equipment and the system could only be maintained by the contracted automated fingerprint identified system (AFIS) supplier. The HANIS system is running on old equipment and software that needs to be upgraded urgently since it cannot be maintained effectively anymore. The implementation will entail migration of the current HANIS data (fingerprints and facial recognition) to the new ABIS, with improved functionality, installation and configuration of ABIS infrastructure (hardware) and building of system functionalities. As from May 2019 the ABIS and HANIS systems will run parallel until March 2021 when HANIS will be decommissioned.

[Adapted from: *https://www.itweb.co.za/content/VgZeyvJAZ8DqdjX9*]

2.2.1 The objectives of a feasibility study are to find out if an information system project can be done and to suggest possible alternative solutions.

Differentiate between FOUR different types of feasibility studies.

(4 × 2) (8)

2.2.2 Give TWO benefits of using facial recognition as an access-control mechanism for the computer system of an organisation. (2)

2.2.3 Define each of the following terms in the context of the given snippet:

(a) Adoption strategy

(b) Migration

(2 × 2) (4)

2.2.4 Identify the adoption strategy used in the initial implementation of the ABIS system. (1)

2.2.5 Give TWO reasons why the adoption strategy identified in QUESTION 2.2.4 was used during the implementation of the ABIS system. (2)

2.2.6 Differentiate between TWO other implementation strategies that could have been used during the implementation. (2 + 2) (4)

[31]

QUESTION 3

3.1 Explain TWO roles of a system analyst. (2 × 2) (4)

3.2 List SIX data gathering techniques. (6)

3.3 The table below contains South African employee data.

Field name	Data type	Field size for display	Description	Example
Employee ID number	Text	13	Unique ID of each employee	8901237890912
Name	Text	20	Name of employee	David Maxwell
Date of birth	Date/Time	10	DOB of employee	08/03/1995
Phone number	Integer	10	Phone number of employee	(011) 123 4567

[Adapted from: *https://www.tutorialspoint.com/What-is-Data-Dictionary*]

3.3.1 Define each of the following terms:

(a) Metadata

(b) Data dictionary

(c) Data type

(d) Record

(4 × 2) (8)

3.3.2 Which field name will be regarded as the primary key? (1)

3.3.3 Give a reason for the answer to QUESTION 3.3.2. (1)

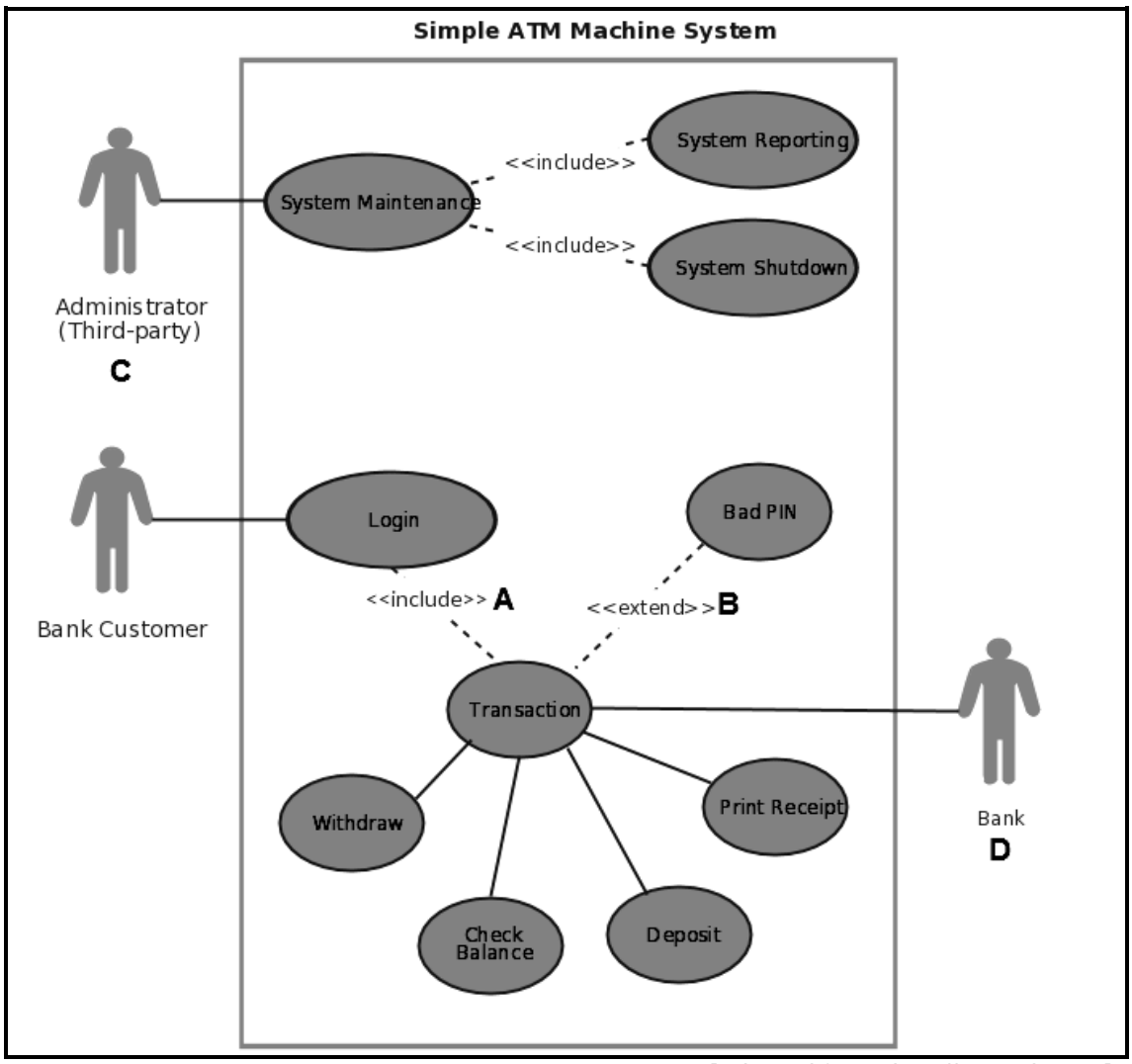
3.3.4 Give a reason why the *Employee ID number* field size is 13 digits? (1)

3.4 Differentiate between *open-ended questions* and *closed-ended questions*. (2 + 2) (4)

[25]

QUESTION 4

4.1 Study the use case diagram shown in FIGURE 1 and answer the questions.



[Adapted from: *http://creately.com*]

FIGURE 1

4.1.1 Define the term *actor* in terms of a use case diagram. (2)

4.1.2 Identify ONE primary actor and ONE secondary actor from the given diagram. (2)

4.1.3 Explain the use of the keyword *include* identified as label A, between the *Login* and *Transaction* use cases. (2 × 1) (2)

4.1.4 Explain the use of the keyword *extend* identified as label B, between the *Bad PIN* and *Transaction* use cases. (2 × 1) (2)

4.1.5 What is the function of the administrator identified as label C? (1)

4.1.6 What is the function of the bank identified as label C? (1)

4.2 Read the following scenario and answer the questions.

You have been approached to assist with the design requirements of a Hair Salon application (App). The owner outlined some of the envisaged functionality that she wants her system to be able to provide her as well as her clients, and which processes she thinks it would need to manage.

She provided the following information:

A customer should be able to browse available timeslots and book for an appoint.

A customer with typically supply:

- his/her customer information and login details and,
- appointment details.

The application will send a notification/confirmation to the customer about the appointment and the required service.

The App should also present some functionality to her clients to pay for the service.

After payment for the service the App should also supply the customer with a receipt.

The owner also loads details about special offers and promotions that are distributed to the clients.

Stylists (Barbers/Hairdressers) get a daily booking schedule indicating their clients and the services that they are to render.

Every week the owner receives detailed reports pertaining to bookings and the financial statements.

4.2.1 Draw a context data-flow diagram to model the main data flows using the given information. (15)

4.2.2 Explain what the difference is between a context diagram and a DFD Level 1 diagram. (3)

4.3 Read the following scenario and answer the questions.

A local entrepreneur has asked you to assist her in creating a data model for the employees in her business. She currently uses a manual system to capture information about employees using an Excel spreadsheet as shown in FIGURE 2. Each employee is employed in only one department at a time. Employees can also move to different departments from time to time. Each department has a fixed location.

Employee Nr	Name	Surname	ID	Extension	Title	Cellphone	Department	Department Location
EMP00046	Carmen	Ngobeni	5208101492066	1038	Mrs	0839858126	Human Resources	HR-Building 2
EMP00047	Kamzati	Mavuso	5710217460034	1088	Dr	0822595794	Sales	Storefront
EMP00047	Kamzati	Mavuso	5710217460034	1088	Dr	0822595794	Marketing	Upper Level Storefront
EMP00048	Khanya	Ngoza	8111065134019	3907	Mr	0822595794	Marketing	Upper Level Storefront
EMP00057	Loyiso	Makamba	8108045566063	3785	Mr	0827183829	Sales	Storefront
EMP00058	Lutho	Mcetywa	5002057913048	1931	Mr	0827878490	Sales	Storefront
EMP00059	Lwambeso	Pistoli	5506237098058	1577	Mr	0828223613	Accounting	Lower Level Storefront
EMP00060	Mabambodidi	Toyiya	7506036830021	2054	Mr	0828377762	Sales	Storefront
EMP00069	Caryn	Jacobs	7602134886097	2569	Mrs	0839499608	Human Resources	HR-Building 2
EMP00070	Masixole	Xotyeni	5912028582026	2428	Mr	0839858126	Marketing	Upper Level Storefront
EMP00070	Masixole	Xotyeni	5912028582026	2428	Mr	0839858126	Human Resources	HR-Building 2
EMP00071	Mbasa	Lupuwana	5606298161097	1595	Mr	0722595794	Marketing	Upper Level Storefront
EMP00071	Mbasa	Lupuwana	5606298161097	1595	Mr	0722595794	Accounting	Lower Level Storefront
EMP00072	Lerato	Baloyi	7910100054087	8741	Miss	0871143285	Sales	Storefront
EMP00072	Lerato	Baloyi	7910100054087	8741	Miss	0871143285	Sales	Storefront
EMP00072	Lerato	Baloyi	7910100054087	8741	Miss	0871143285	Sales	Storefront

FIGURE 2

Please turn over

Use the given information to create an ERD (entity-relationship diagram) using the CHEN notation to represent a suitable data model for the scenario.

Include all related fields and indicate all applicable key fields (primary and foreign keys where applicable). Also indicate the relationship types. (13)

4.4 Explain the importance of database normalisation. (3)

4.5 Identify ONE level of database normalisation. (1)

4.6 Study the following basic class diagram that will be used to instantiate an appointment object for use as part of the Salon Application and answer the questions that follow.

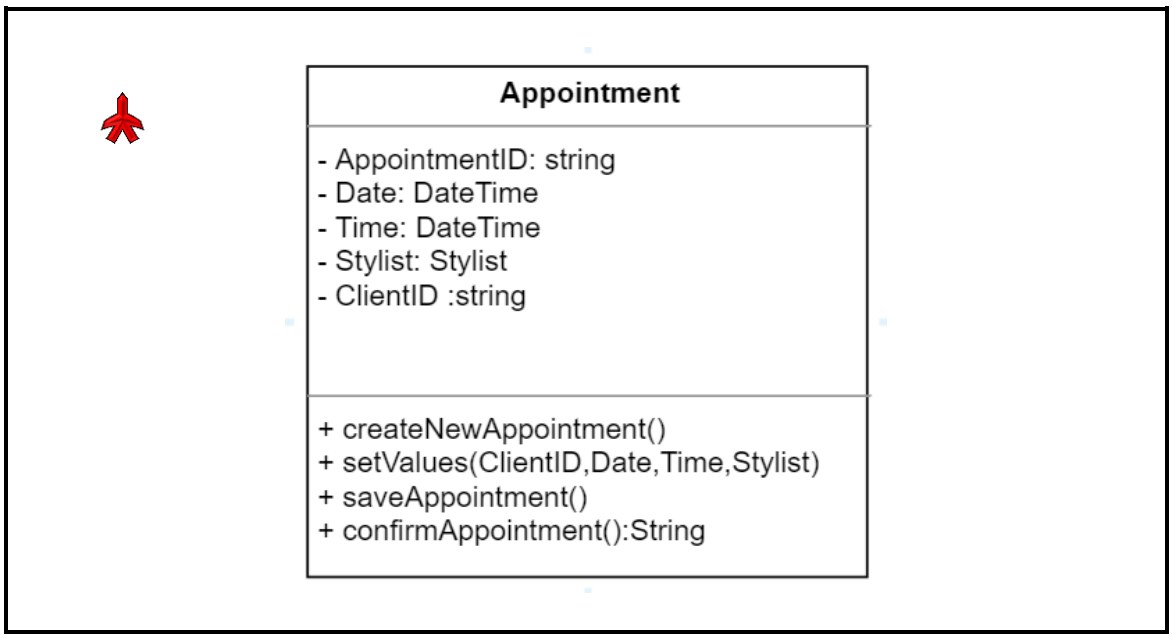


FIGURE 3

4.6.1 Explain what the + indicates as part of the diagram. (2)

4.6.2 How many attributes does the class encapsulate? (1)

4.6.3 Define the term: instantiation. (2)

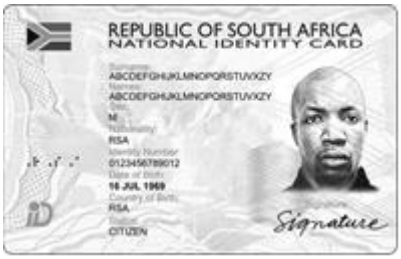
4.6.4 Draw a simple systems sequence diagram using Figure 3 as reference, that will depict a client making a booking with the Salon App. (6)

[56]

QUESTION 5

5.1 Read the following snippet and answer the questions.

South African identity



A South African ID number forms a very important part of our lives and enables key access to public services. Our identity is the primary means of input into various other systems used across government as well the private sector, such as banks, the South African Social Service Agency, etc. The Department of Home Affairs allows other systems to connect to the system interface of the current HANIS system. The following information will help you understand what the numbers in your South African ID represents.

A South African ID number is a 13-digit number which is defined by the following format: YYMMDDSSSSCAZ.

- The first 6 digits (YYMMDD) are based on your date of birth.
- The next 4 digits (SSSS) are used to define your gender. Females are assigned numbers in the range 0000-4999 and males from 5000-9999.
- The next digit (C) shows if you have a SA citizen status, with 0 denoting that you were born a SA citizen and 1 denoting that you are a permanent resident.
- The last digit (Z) is a checksum digit – used to check that the number sequence is accurate using a set formula called the Luhn algorithm.

[Adapted from: *https://www.itweb.co.za/content/VgZeyvJAZ8DqdjX9*]

5.1.1 Define the term *data processing*. (2)

5.1.2 What is the purpose of the last digit in a South African ID number? (2)

5.1.3 Explain THREE common properties of identification codes. (3)

5.1.4 Define the term *system interface*. (2)

5.1.5 Decode the following computer-generated examples of South African ID numbers and complete the table by writing only the answer next to the letter (a–f) in the ANSWER BOOK.

ID number	Gender	Citizenship	Date of birth
4507155278083	**(a)**	**(b)**	**(c)**
7905024426188	**(d)**	**(e)**	**(f)**

(6 × 1) (6)

5.2 Read the following snippet and answer the questions.

Why Capitec launched a whole new banking app

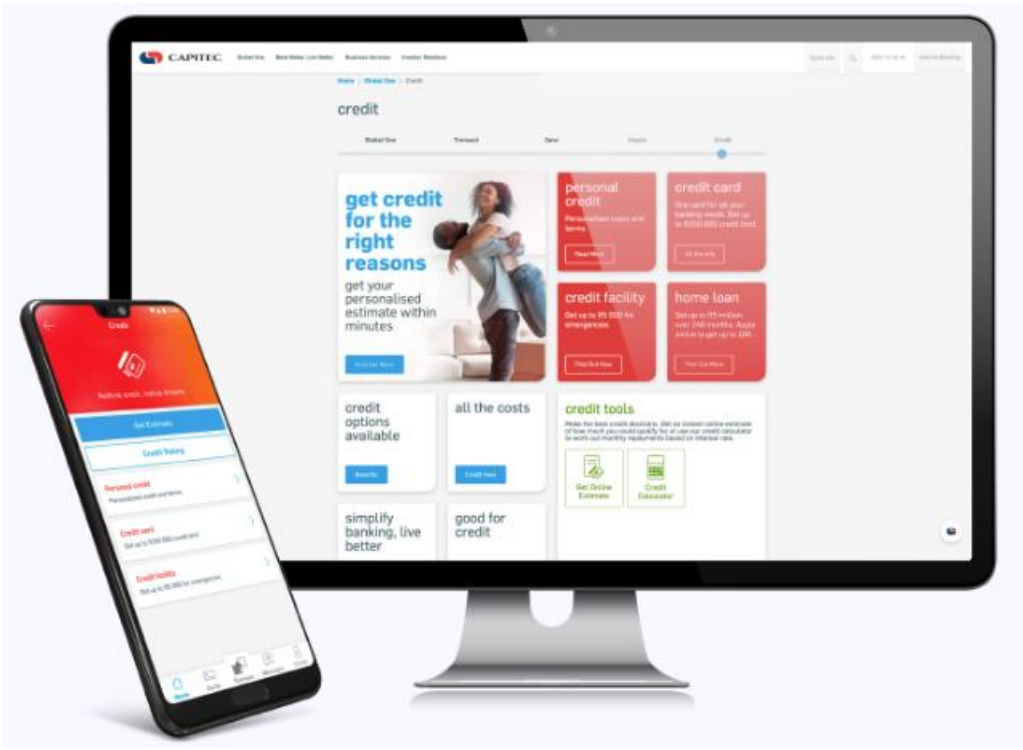


FIGURE 4

At the end of 2019, South Africa's biggest retail bank, Capitec, launched a new mobile banking app. This raised the question among some clients – why did the bank not just update its existing app?

The new platform was designed from the ground up to be much more "plug-and-play", allowing the banking group to not only address the needs of clients as they stand today, but also future-proof it for any new technologies which may be developed. Another reason for the new app, was personalisation and customisation.

The new app was designed with our clients' convenience in mind and is even easier to use than our current app. The app has a new look for quick and simple navigation, as well as the following added features:

- Personalised home screen – See all your accounts and balances at a glance
- Customise your favourites – Set up shortcuts on your home and sign-in screens for one-tap access to the features you use the most
- Track your spend – Get a quick overview of how you're spending your money with categories like food, transport or communication
- Use biometric – Sign in and authenticate with fingerprint or facial recognition if your phone supports this
- Manage contactless card transactions – Turn your card's tap to pay function on and off

[Adapted from:
https://www.capitecbank.co.za/bank-better-live-better/articles/best-way-to-bank/new-app-features/
https://www.iol.co.za/technology/capitec-bank-launches-brand-new-banking-app-36696177]

5.2.1 Define the term: mobile app. (2)

5.2.2 Explain what the term “plug-and-play” means in the context of the article. (2)

5.2.3 Differentiate between, personalisation and customisation. (2)

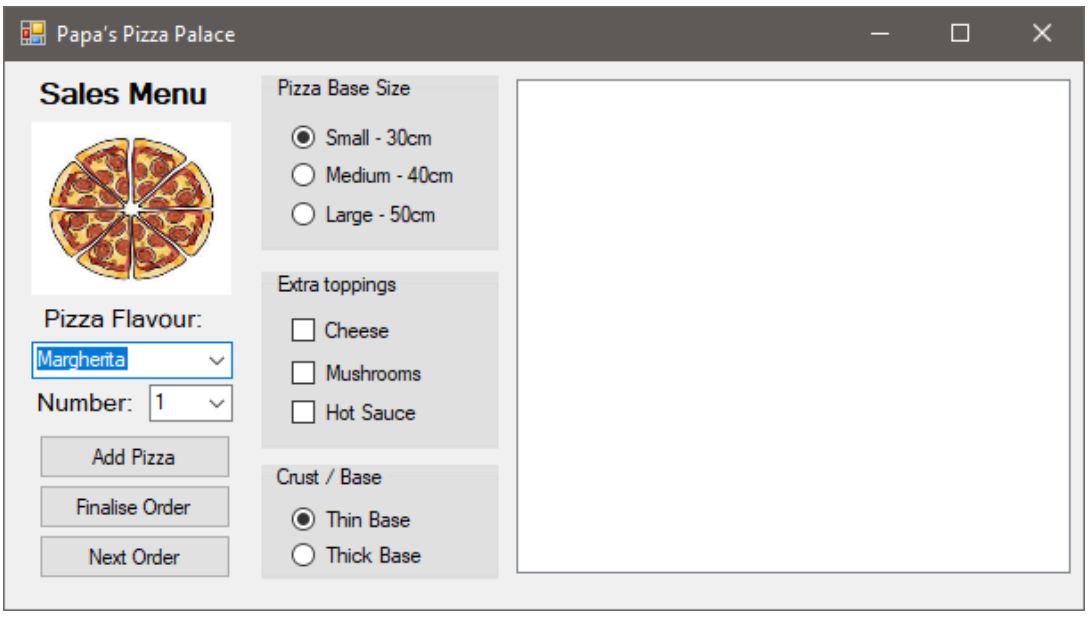
5.2.4 List TWO advantages of a Mobile graphical user interface such as the interface shown in FIGURE 4. (2)

5.2.5 State TWO advantages that a graphical user interface presented as part of a web page has over a mobile user interface, as shown in FIGURE 4. (2)

5.3 Study the following small description and user interface and answer the questions that follow.

Papa’s Pizza Palace offers different pizzas on their menu and for each pizza flavour, the price for a small pizza is provided. A customer will either enter the store and place his/her order at the counter or over the phone. The application generates an order number and an order slip containing the details of the order that are to be sent to the kitchen.
One order can comprise of many different sizes of pizzas with different extra toppings and different crusts. The order slip also contains the subtotal and the total after VAT at 15% has been added.

Design the generic layout of an order slip which is to be generated and displayed in the list box component. (7)



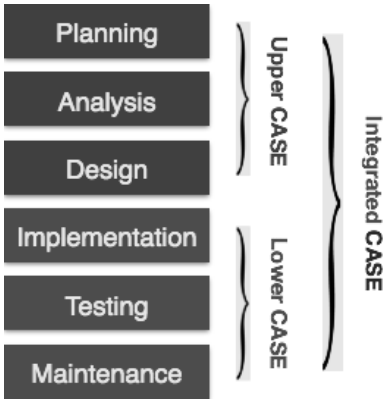
[32]

QUESTION 6

Read the following snippet and answer the questions.

CASE tools

A computer-aided software-engineering (CASE) tool is a type of software tool primarily used to design and implement applications. CASE tools are used to design hardware products and are like computer-aided design (CAD) tools. High-quality software which is defect-free and maintainable is usually developed using a CASE tool. It is used for the development of information systems along with other automated tools. CASE tools allow designers, coders, testers and managers to share a common view as to where a project stands at each stage of the development process. It ensures a disciplined, check-pointed process. CASE tools portray progress graphically.



The benefits of CASE tools are that it makes the customer part of the process thereby ensuring that a product meets real-world requirements. As more emphasis is placed on the testing and redesign in the development process, the cost of servicing any product can be reduced over its lifetime.

CASE tools are categorised into upper CASE tools, and lower-CASE tools. The upper-CASE tools concentrate on the starting phases of system development, for example, planning, goals and objectives. The essential data is assembled and, through upper CASE tools, displayed in a sorted-out way. Lower CASE devices concentrate on later parts of system development, for example, planning, coding, testing the product for defects and functionalities, implementation, usage and maintaining the software. Testing and maintenance of software form a gigantic part of software improvement.

[Adapted from: *https://www.mbaskool.com/business-concepts/*]

6.1 State the main function of CASE tools. (1)

6.2 Differentiate between the TWO categories of CASE tools mentioned in the article. (2)

6.3 Name TWO advantages of using CASE tools (2)

6.4 State THREE examples or applications of CASE tools. (3)
[8]

QUESTION 7

7.1 Define the term: *Agile software development.* (2)

7.2 Scrum is an example of one Agile methodology
List TWO other examples of Agile software methodologies (2)

7.3 Discuss the principles and operations behind Scrum as an Agile methodology (4)
[8]

TOTAL SECTION B: 160
GRAND TOTAL: 200