higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

SYSTEM ANALYSIS AND DESIGN
NQF LEVEL 4

(10041004)

7 November 2022 (X-paper)
09:00–12:00

Calculators may be used.

This question paper consists of 16 pages.

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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 question on a new page.
5. Use only a blue or black pen.
6. Write neatly and legibly.

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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 A system analyst usually works together with the … who use(s) the design specifications given by the system analyst to create a computer system.

A database administrator
B developers
C network engineer
D support analyst

1.1.2 Google Forms is an example of a tool that can be used to create a/an online … that can be implemented as a data gathering technique.

A questionnaire
B observation
C interview
D source document

1.1.3 The purpose of Joint Application Development (JAD) is to …

A rapidly enable the deployment of an information system.
B collaboratively develop business system requirements.
C create a once-off working model of the system.
D present new concepts to stakeholders for approval.

1.1.4 A linear approach to software development is referred to as a …

A waterfall approach.
B dynamic approach.
C black-box approach.
D static approach.

1.1.5 The analysis and design process of a user interface is iterative and can be represented by the … model.

A waterfall
B agile
C RAD
D spiral

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1.1.6 Information that is presented and distributed in an organised, formatted, and meaningful manner is known as …

A a report.
B a form.
C an interface.
D a use case.

1.1.7 … is best explained as research in the design and the use of computer technology, which focuses on the interfaces between people and computers.

A Design analysis
B Problem solving
C Human-computer interaction
D Data flow diagramming

1.1.8 In System Analysis and Design, large or complex functionalities are more easily understood when broken down into pieces using a/an …

A state chart.
B process decomposition diagram.
C flow diagram.
D entity relationship diagram.

1.1.9 The process of capturing data in an MS Excel spreadsheet on a stand-alone computer is an example of a/an …

A online entry.
B offline entry.
C manual entry.
D automatic entry.

1.1.10 … refer(s) to the concept of object-oriented programming that "shows" only essential attributes and "hides" unnecessary information.

A Classes
B Inheritance
C Polymorphism
D Abstraction

(10 × 1) (10)

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1.2 Indicate whether the following statements are TRUE or FALSE. Choose the correct answer and write only 'True' or 'False' next to the question number (1.2.1–1.2.10) in the ANSWER BOOK

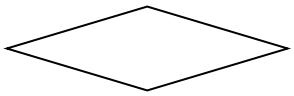
1.2.1 When eliciting requirements, the analyst must consider those both inside and outside the system and context boundaries.

1.2.2 UML class diagrams are a good way to represent the algorithmic nature of the interactions between classes.

1.2.3 Gmail is a popular example of a web-based application.

1.2.4 A request for a proposal is a business process in which an organisation requests an estimate of prices from a supplier for the purchase of specific products or services.

1.2.5 With crows-foot notation, a relationship is represented by the following notation:



containing the relationship's name.

1.2.6 A structure chart can be used to represent the structure of models in a system.

1.2.7 An interviewer is not allowed to discuss the objectives of an interview with the interviewee.

1.2.8 Data migration is the process of transferring data from one system to another.

1.2.9 A pilot implementation strategy allows an organisation to validate its approach for full application deployment.

1.2.10 Software engineering entails writing a technical description of software that will meet user requirements.

(10 × 1) (10)

1.3 Write the following acronyms in relation to the Information and communications technology sector in full:

1.3.1 ANSI

1.3.2 ASCII

1.3.3 CISO

1.3.4 ITA

1.3.5 OCR

1.3.6 QA

1.3.7 SBA

1.3.8 VPN

1.3.9 RUP

1.3.10 MIS

(10 × 1) (10)

1.4 Choose an item from COLUMN B that matches a description in COLUMN A. Write only the letter (A–S) next to the question number (1.4.1–1.4.10) in the ANSWER BOOK.

COLUMN A		COLUMN B	
1.4.1	Question with only two possible answers	A	XP
1.4.2	A somewhat informal technique that can help you assess user needs and feelings both before interface design and long after implementation	B	dichotomous
		C	DSS
		D	observation
1.4.3	A specialised computer used to create web applications and a server environment to run them	E	Scrum
		F	Kanban
1.4.4	A type of information system that uses Internet web technologies to deliver information and services	G	web application server
1.4.5	An iterative design process in which designers focus on the users and their needs in each phase of the design process	H	DFD
		I	user-centred
		J	monotonous
1.4.6	A type of report that show data in rows and columns with information summarized at the intersection points	K	software engineering
1.4.7	An agile software development framework that aims to produce higher quality software	L	database server
		M	system analysis
1.4.8	A brief instruction that pops up when the mouse hovers over a control	N	web-based information system
1.4.9	The systematic application of engineering approaches to the development of systems	O	focus group
		P	tooltip
1.4.10	An agile software development framework used to dramatically improve productivity in teams	Q	alert box
		R	functional report
		S	crosstab report

(10 × 1) (10)

[40]

TOTAL SECTION A: 40

SECTION B

QUESTION 2

Read the following scenario and answer the questions.

Mzansi Drive Savers is a local and trusted data-recovery company. Having just completed your Level 3, you were recruited by them as an intern during the July holidays. Part of your duties was to assist the senior technician in the data recovery process. Before the technician attempts to recover data from a computer, he makes an exact copy of the hard drive (sector by sector). However, you have noticed that sometimes the technician proceeds to go through the customer's information and keeps anything that the technician finds to be of some value. Recently, the technician found some software on a customer's computer that allows Windows 10 to be pirated and has asked you if you would like a copy of the software, which you refused.

As part of your other duties, the technician has asked you to install MS Outlook on a customer's laptop and gave you the customer's username and password. Whilst installing the email software, you discovered that the customer's email credentials were leaked on the Internet in a data breach.

2.1 Identify ONE unacceptable practice that the technician is engaging in. (1)

2.2 Substantiate your answer to QUESTION 2.1. (2)

2.3 Identify ONE acceptable practice that the technician is engaging in. (1)

2.4 Explain TWO reasons why using a pirated operating system would be considered a security risk. (2 × 2) (4)

2.5 Define the term *data breach*. (2)

2.6 Suggest TWO methods that the customer can use to make their authentication process more secure. (2 × 2) (4)

2.7 State TWO reasons why it is important for the computer shop to have a code of conduct/ethics for its technicians. (2 × 1) (2)

2.8 The computer technician has since realised the seriousness of his actions and has asked you to recommend a professional association they can join.

List any TWO South African professional associations in the computer industry. (2 × 1) (2)

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2.9 Study the following image and answer the questions that follow:



[Source https://www.wikihow.com/]

FIGURE 1: A DEVICE

2.9.1 Identify the type of device indicated in the image. (1)

2.9.2 Define the term *biometric authentication*. (1)

[20]

QUESTION 3

3.1 Read the following scenario and answer the questions.

You have been given the task of investigating how the registration system at Mzansi TVET College can be improved. Learners are tired of waiting in long queues during registration. You have to find out how the current system actually operates, and how you think you can improve or change it. The college is considering a new system that will speed up the registration process.

You have been asked to develop a plan for fact-finding and have decided to interview various students and the administration staff on their experiences.

You also decided on creating an online survey which students can answer using a web browser or on their smartphones. Your design for the survey was based on closed-ended questions as they limit the answers of the respondents to response options provided on the questionnaire.

Closed-ended questions are often good for surveys, because you get higher response rates when users don't have to type so much.

3.1.1 Define the concept of a *mobile user*. (2)

3.1.2 State any THREE other techniques that can be used in fact-finding at the college, other than an interview and a questionnaire. (3)

3.1.3 List TWO aspects that must be kept in mind when presenting an interview to the students. (2)

3.1.4 Name TWO different types of closed-ended questions, other than a Likert-scale question. (2)

3.1.5 In relation to the scenario and your answer to QUESTION 3.1.4, design a typical question for each of the types of questions you named in QUESTION 3.1.4 which could be used as part of a questionnaire for the students and the administrative staff to improve the college registration system. (2 × 2) (4)

3.1.6 The college management is unsure of using an online questionnaire to gather data from learners.

Give TWO reasons to the college management why an online questionnaire is more efficient than any of the traditional techniques of data gathering. (2 × 2) (4)

3.1.7 After presenting the college management with the two reasons above, they were still unsure of investing in a new system. You then decided to run a pilot-survey with only thirty (30) students in order to establish their level of satisfaction with the current registration process.

You decided to use a 5-point Likert-scale question to gather the data from the class of thirty students. An example of the question is shown in FIGURE 2 below.

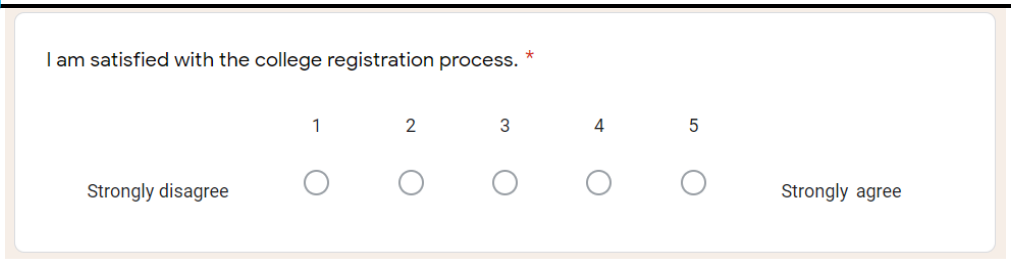

FIGURE 2: LIKERT SCALE QUESTION

After collecting the data, you created an MS Excel spreadsheet where you captured student's responses as shown in FIGURE 3 below.

	A	B	C
1	**Likert Scale Question Options**	**Count**	**%**
2	**Strongly disagree**	**20**	**67%**
3	**Disagree**	**5**	**17%**
4	**Neutral**	**2**	**7%**
5	**Agree**	**2**	**7%**
6	**Strongly Agree**	**1**	**3%**
7	**Total**	**30**	**100%**

FIGURE 3: RESULTS OF RESPONSES

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Using the information from FIGURE 2 and FIGURE 3 respectively, draw a simple column/bar chart to accurately visually summarise the responses of the students that you will present to the management of the college. (4)

3.2 Name THREE types of business source documents. (3)

[24]

QUESTION 4

4.1 Read the following scenario and answer the questions.

With the outbreak of Covid-19, Mzansi TVET College has decided to pursue the route of online assessments. Consequently, holding online assessments with sufficient reliability and effectiveness became one of the most critical and challenging concerns for the college. They have decided on using the following approach:

- Students will have to register on an online portal using their student number, which is stored as a string.
- Using the student number, the portal will be able to retrieve their existing student enrolment information from the college's learning management system (LMS) for verification purposes.
- The college's administration department will manage all important information regarding all assessments that will be undertaken, which will then allow them to generate a timetable schedule for the assessments.
- Assessments will then be prepared by subject lecturers which will from time to time update the assessments by adding new and relevant questions.
- Students will then take the examination after they have logged in, using the credentials they created when registering.
- After writing the examination, the students and lecturers will be able to view their results once it is available.

4.1.1 Use the information given in the scenario to draw a UML use-case diagram for the online assessment system.

NOTE: Show ALL associations and relationship dependencies. (17)

4.1.2 The Deputy Principal: Academic Services would like to understand how the login process would work, as there are some concerns that the online system might be abused. You have explained to the deputy principal that users will log on using their username and password. After the credentials have been entered it is verified, and if correct, access is given to the system. If they enter incorrect information three times, their account will be locked out to prevent unauthorised use.

Create a flow chart to visually depict the login process for the college. Your flow chart must show ALL inputs, logical flows, conditions, calculations (such as counting the number of login attempts) and output using appropriate symbols. (12)

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4.1.3 The System Analysis and Design lecturer at Mzansi TVET College created a UML class diagram as part of the design process for the online examination system.
A partial snippet of the diagram for a student who will take the assessment is illustrated in FIGURE 4 below. However, the class diagram is incomplete.

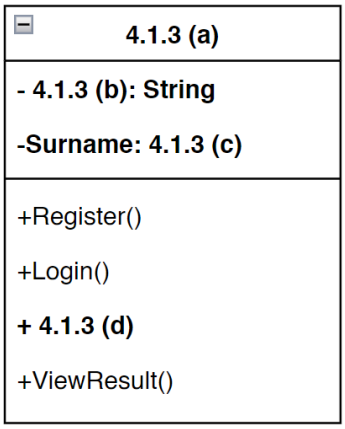


FIGURE 4: Partial UML Class Diagram

Complete the UML class diagram by writing only the omitted part (either a method name, data type, or class name) as the answer next to the letter (a–d) in the ANSWER BOOK. (4)

4.1.4 The Deputy Principal: Academic Services has so far been satisfied with the preliminary design of the web-based assessment system. However, the deputy principal wants to be able to understand the flow of information through this online system.

Use the information provided in the scenario to draw a context data flow diagram for the online assessment system. (12)

4.2 Read the following outline as well as the description below and answer the question that follows

For the Mzansi TVET College online assessment system the following business rules have been identified.

A student will register for an assessment and an assessment is administrated by a lecturer. A lecturer can administer various assessments.

For every student, a student number, name, surname, and course code are stored. Every lecturer is identified by a Staff ID, name and surname.

Each assessment is set by a lecturer and taken by student. The assessment is identified by a code and a description, duration, and total marks. The result of the assessment obtained by the student is also stored.

Use the information provided in the scenario to draw an Entity relationship diagram using the crows-foot notation.

Indicate all entities, keys, relationships, and cardinalities. (15)

[60]

QUESTION 5

5.1 The Deputy Principal: Academic Services has asked you to design a basic user interface for the **registration webpage** of the online web portal they intend to use with online assessments.

The webpage requires the following information to be captured:

- Student Number
- Student Name
- Student Surname
- Student Username
- Student Password

The webpage must also facilitate typographical errors to be avoided when entering the password. (7)

5.2 Read the following excerpt and answer the questions.



The end of an iconic era

Let's have a moment to remember the days when the BlackBerry ruled the mobile phone arena. The devices, with the quirky-sounding name BlackBerry and the iconic QWERTY keyboard that conditioned many people to type with their thumbs, were more popular than iPhones, Huawei's, and Samsung's during the late 2000s. In the world of input hardware, however, nothing gold can stay – physical keyboards included. RIP to Blackberry as the physical keyboards were slowly replaced by newer, modern interactive technologies that are now being used in devices such as the iPhone, Samsung Galaxy and even newer ways of human-computer interaction through the likes of Alexa, Siri, Cortana and Google Assistant, making our computer interaction all the more interactive and adaptive. Even Microsoft's Surface tablet is allowing your typical desktop application to make use of these new technologies, thereby shaping the future experience users will have.

[Adapted from: *https://techcrunch.com/2022/01/03/seriously-its-time-to-get-rid-of-that-classic-blackberry-for-real-now/*]

5.2.1 Define the following terms:

(a) User interface

(b) Desktop application

(c) Adaptive interface

(d) Wireframe

(e) User experience

(5 × 2) (10)

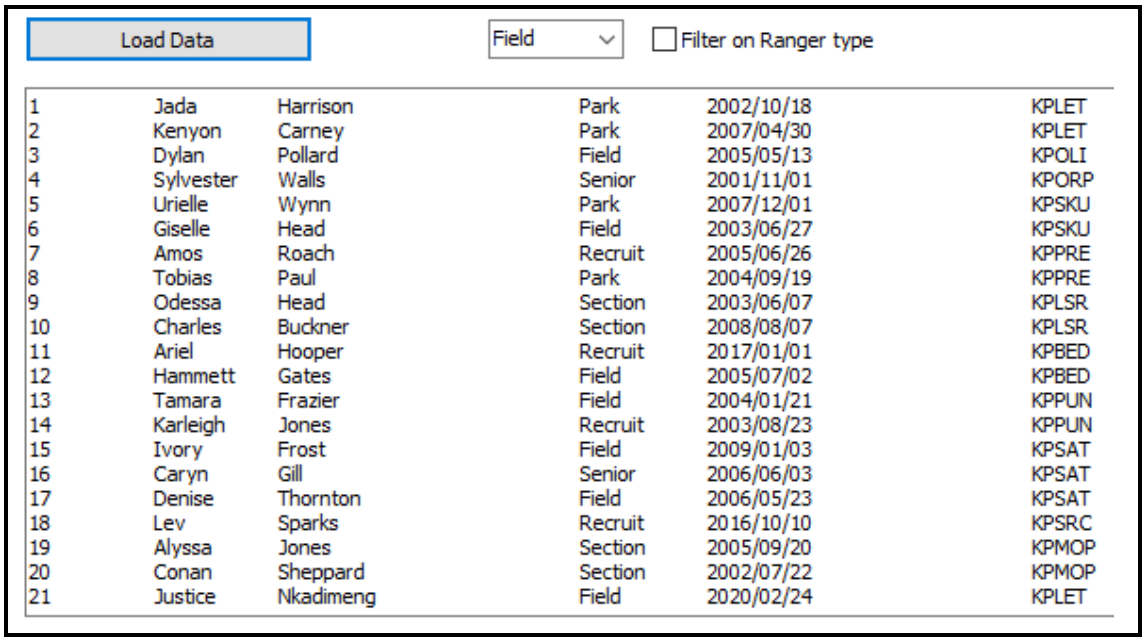
5.2.2 Discuss THREE interactive technologies being used in human-computer interaction that are slowly replacing the use of the keyboard and mouse. (3 × 2) (6)

5.2.3 State any THREE Schneiderman principles for human-computer interaction. (3)

5.3 Read the following statement:

'Similarly, to printed output, system analysts need to consult with users when designing output that will be displayed on a screen.'

Study the following screenshot of a screen report showing the details of game rangers in the Kruger national park and answer the questions that follow.



1	Jada	Harrison	Park	2002/10/18	KPLET
2	Kenyon	Carney	Park	2007/04/30	KPLET
3	Dylan	Pollard	Field	2005/05/13	KPOLI
4	Sylvester	Walls	Senior	2001/11/01	KPORP
5	Urielle	Wynn	Park	2007/12/01	KPSKU
6	Giselle	Head	Field	2003/06/27	KPSKU
7	Amos	Roach	Recruit	2005/06/26	KPPRE
8	Tobias	Paul	Park	2004/09/19	KPPRE
9	Odessa	Head	Section	2003/06/07	KPLSR
10	Charles	Buckner	Section	2008/08/07	KPLSR
11	Ariel	Hooper	Recruit	2017/01/01	KPBED
12	Hammett	Gates	Field	2005/07/02	KPBED
13	Tamara	Frazier	Field	2004/01/21	KPPUN
14	Karleigh	Jones	Recruit	2003/08/23	KPPUN
15	Ivory	Frost	Field	2009/01/03	KPSAT
16	Caryn	Gill	Senior	2006/06/03	KPSAT
17	Denise	Thornton	Field	2006/05/23	KPSAT
18	Lev	Sparks	Recruit	2016/10/10	KPSRC
19	Alyssa	Jones	Section	2005/09/20	KPMOP
20	Conan	Sheppard	Section	2002/07/22	KPMOP
21	Justice	Nkadimeng	Field	2020/02/24	KPLET

5.3.1 Referring to the principles of good report design, identify TWO missing design elements from the given report. (2 × 1) (2)

5.3.2 The 5th column in the report shows the date that the ranger was employed as a field from the Rangers table in the database.

If the Years of employment are also to be displayed as part of the report, should it be stored in the database or not? (1)

5.3.3 Motivate your ANSWER for 5.3.2 (1)

5.3.4 On the screenshot it is evident that the data for the report can be filtered based on the Ranger type which is listed in the 4th column.

Explain what a filter is in this context. (2)
[32]

QUESTION 6

Read the following snippet and answer the questions.

SOFTWARE IMPLEMENTATION

In computing, adoption means the transfer (conversion) between an old system and a target system in an organisation. If a company works with an old software system, it may want to use a new system which is more efficient, has more work capacity, has passed alpha and beta testing, etc. So, then a new system needs to be adopted after which it can be used by users. There are several adoption strategies that can be used to implement a system in an organisation. The main strategies are big bang adoption, parallel adoption, and phased adoption.

[Adapted from: *https://en.wikipedia.org/wiki/Adoption_(software_implementation)*]

6.1 Define the following terms:

6.1.1 Beta testing

6.1.2 Big bang adoption

6.1.3 Phased adoption

(3 × 2) (6)

6.2 Differentiate between a *pilot implementation* and a *parallel implementation*.

(2 × 2) (4)

6.3 List TWO fundamental reasons why software often share the same features. (2)

[12]

QUESTION 7

7.1 Define the term *agile methodology*. (2)

7.2 List TWO types of agile methodologies. (2)

7.3 Name the FIVE steps in the deployment of application software. (5)

7.4 List THREE core values of agile software development. (3)

[12]

TOTAL SECTION B: 160
GRAND TOTAL: 200

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