


Faculty of Information and Communication Technology										
 <p><b>Tshwane University of Technology</b> <i>We empower people</i></p> <p>I declare that I am familiar with, and will abide to the Examination rules of Tshwane University of Technology</p> <p>_____</p> <p>Signature</p>	<p><b>COURSE NAME: Development Software IIIA</b></p> <p><b>COURSE CODE: DSO34AT</b></p>									
	<p>Semester test 1 90 min August 2015 Total 70</p>					<p>1<sup>st</sup> Examiner: Mr A Buitendag</p> <p>2<sup>nd</sup> Examiner: Mr FG Hattingh</p>				
	Student number									
	Surname					Initials				
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**Question 1****(3x2)**

Double barrel true and false statements. Study the following two statements (i and ii) and select the correct answer from the options A to D below. Encircle the correct letter. (A, B, C or D)

- 1.1    i)      Data and information are essentially the same thing.  
       ii)      Data constitute the building blocks of information.
- A      The statement i is true, and ii is false  
 B      The statement i is false, and ii is true  
 C      Both of the statements i and ii are true  
 D      Both of the statements i and ii are false
- 1.2    i)      The DBMS reveals much of the database's internal complexity to the application programs and users.  
       ii)      One disadvantage of the DBMS is that it increases the risk of data security breaches.
- A      The statement i is true, and ii is false  
 B      The statement i is false, and ii is true  
 C      Both of the statements i and ii are true  
 D      Both of the statements i and ii are false

- Question 2** **(4x2)**

Discuss four examples of such costs.

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and extend across the width of the page. There are no margins, text, or other markings on the paper.

### Question 3

(12)

Study the following images and answer the questions that follows:

**Schedules**

Schedules : Table

Field Name	Data Type
IDSchedule	Number
SFromAP	Short Text
SToAP	Short Text
SDepTime	Short Text
SArrTime	Short Text
SBaseFare	Currency
PlaneID	Short Text

General Lookup

Field Size	Long Integer
Format	
Decimal Places	Auto
Input Mask	
Caption	
Default Value	
Validation Rule	
Validation Text	
Required	Yes
Indexed	Yes (No Duplicates)
Text Align	General

Schedules							
IDSchedule	SFromAP	SToAP	SDepTime	SArrTime	SBaseFare	PlaneID	
1	JNB	BFN	08:40	10:00	R 480.00	Tax0021	
2	JNB	BFN	13:10	14:35	R 480.00	Tax0021	
3	JNB	DBN	11:40	12:55	R 480.00	Tax1079	
4	CPT	BFN	06:00	07:45	R 560.00	Tax0135	
5	CPT	BFN	15:35	17:25	R 560.00	Tax0135	
6	BFN	CPT	09:00	10:45	R 560.00	Tax0135	
7	BFN	CPT	18:55	20:40	R 560.00	Tax0135	
8	BFN	JNB	11:00	12:20	R 480.00	Tax0021	
9	BFN	JNB	16:00	17:20	R 480.00	Tax0021	
10	BFN	DBN	13:00	14:35	R 620.00	Tax0007	
11	BFN	DBN	08:10	09:40	R 620.00	Tax0007	
12	DBN	BFN	16:00	17:30	R 620.00	Tax0007	
13	DBN	BFN	10:20	11:50	R 620.00	Tax0007	
14	JNB	BFN	06:00	07:15	R 710.00	Tax0542	

- 3.1 Identify what the part of the structure the arrow points to. (2)
- 3.2 Discuss the importance of having such entries as part of a DBMS. (4)
- 3.3 Identify all possible foreign keys that could be applicable as part of the table design. Motivate your answer. (3)
- 3.4 It is indicated that the IDSchedule field is indexed, what does this entail and why is it a very important aspect of relational databases design? (3)

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[illegible]

### Question 4

**(8)**

The Database development life cycle consist of six phases, of which the first two are 1) The initial study and 2) The database design. List the four actions applicable to each of these phases in the correct order. Write down the phase and the actions.

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### Question 5

**(4x2)**

Differentiate between the internal model and the physical model, relating to the various degrees of abstraction.

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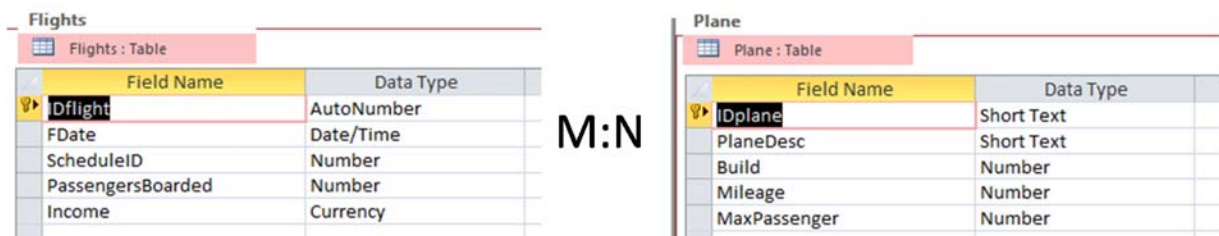
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[illegible]

### Question 6

(8)

Study the following figure and answer the questions that follow:



Many planes can take (schedule) many flights

- 6.1 What is the problem with the current relationship as presented above, and why? (2)
- 6.2 Using the tables and the descriptions explain with an example (relating to the figure) how you would solve this problem. (6)

[illegible]

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**Question 7****(20)**

Study the following description of a set of business rules, pertaining to the United Helpers non-profit organization.

***The organization provides aid to people after natural disasters. Complete the partial Crows foot ERD given. Indicate all applicable fields, keys and cardinalities.***

*Individuals volunteer their time to carry out the tasks of the organization. For each volunteer, their name, address, and telephone number are tracked. Each volunteer may be assigned to several tasks during the time that they are doing volunteer work, and some tasks require many volunteers. It is possible for a volunteer to be in the system without having been assigned a task yet. It is possible to have tasks that no one has been assigned. When a volunteer is assigned to a task, the system should track the start time and end time of that assignment.*

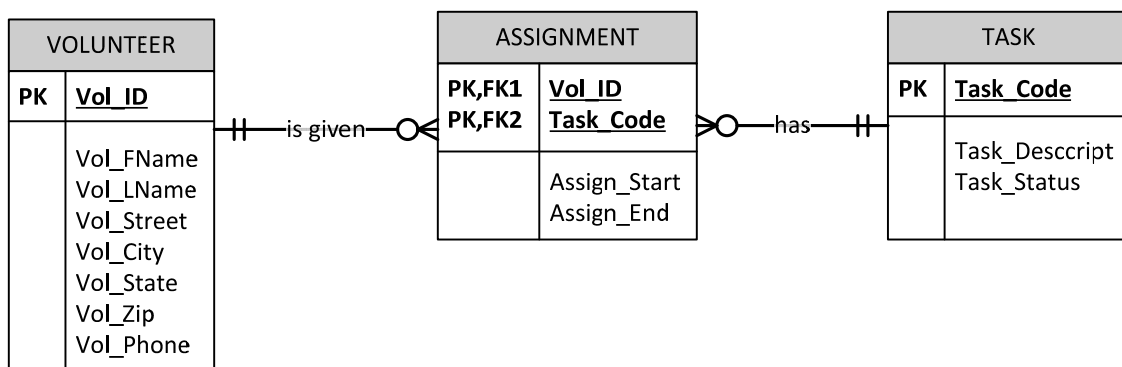
*For each task, there is a task code, task description, task type, and a task status. For example, there may be a task with task code "101," description of "answer the telephone," a type of "recurring," and a status of "ongoing." There could be another task with a code of "102," description of "prepare 5000 packages of basic medical supplies," a type of "packing," and a status of "open." For all tasks of type "packing," there is a packing list that specifies the contents of the packages. There are many different packing lists to produce different packages, such as basic medical packages, child care packages, food packages, etc. Each packing list has a packing list ID number, packing list name, and a packing list description, which describes the items that ideally go into making that type of package. Every packing task is associated with only one packing list. A packing list may not be associated with any tasks, or may be associated with many tasks. Tasks that are not packing tasks are not associated with any packing list.*

*Packing tasks result in the creation of packages. Each individual package of supplies that is produced by the organization is tracked. Each package is assigned an ID number. The date the package was created, and total weight of the package is recorded. A given package is associated with only one task. Some tasks (e.g., "answer the phones") will not have produced any packages, while other tasks (e.g., "prepare 5000 packages of basic medical supplies") will be associated with many packages. The packing list describes the ideal contents of each package, but it is not always possible to include the ideal number of each item. Therefore, the actual items included in each package should be tracked. A package can contain many different items, and a given item can be used in many different packages.*

*For each item that the organization provides, there is an item ID number, item description, item value, and item quantity on hand stored in the system. Along with tracking the actual items that are placed in each package, the quantity of each item placed in the package must be tracked too. For example, a packing list may state that basic medical packages should include 100 bandages, 4 bottles of iodine, and 4 bottles of hydrogen peroxide. However, because of the limited supply of items, a given package may include only 10 bandages, 1 bottle of iodine, and no hydrogen peroxide. The fact that this package includes bandages and iodine needs to be recorded along with the quantity of each that is included. It is possible for the organization to have items donated that have not been included in any package yet, but every package will contain at least one item.*

### Question 7

Partial ERD. Using this page add all the necessary entities, fields, cardinalities and relationships.





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[illegible]

# MEMO

## Question 1

(3x2)

- |     |   |        |    |       |   |   |    |
|-----|---|--------|----|-------|---|---|----|
| 1.1 | i | False, | ii | True  | = | B | ✓✓ |
| 1.2 | i | False, | ii | False | = | D | ✓✓ |
| 1.3 | i | True,  | ii | False | = | A | ✓✓ |

## Question 2

(4x2)

Study the following statement: Although the database system yields considerable advantages over previous data management approaches, database systems do impose significant costs.

Discuss four examples of such costs.

- 1) **Increased acquisition and operating costs.** Database systems require sophisticated hardware and software and highly skilled personnel. The cost of maintaining the hardware, software, and personnel required to operate and manage a database system can be substantial.
- 2) **Management complexity.** Database systems interface with many different technologies and have a significant impact on a company's resources and culture. The changes introduced by the adoption of a database system must be properly managed to ensure that they help advance the company's objectives. Given the fact that databases systems hold crucial company data that are accessed from multiple sources, security issues must be assessed constantly.
- 3) **Maintaining currency.** To maximize the efficiency of the database system, you must keep your system current. Therefore, you must perform frequent updates and apply the latest patches and security measures to all components. Because database technology advances rapidly, personnel training costs tend to be significant.
- 4) **Vendor dependence.** Given the heavy investment in technology and personnel training, companies may be reluctant to change database vendors. As a consequence, vendors are less likely to offer pricing point advantages to existing customers and those customers may be limited in their choice of database system components.
- 5) **Frequent update and replacement cycles.** Companies often add new and enhanced features to their software which could lead to version dependencies and conflicts with compatibility etc. Costs could be involved in the purchasing of new versions and features.

## Question 3

(12)

- 3.1 The arrow points to some metadata (Data Dictionary) entries for the IDSchedule PK field of the Flights table.
- 3.2 The data dictionary contain entries relating to the Meta data of the DB.  
Metadata is data about data. That is, metadata define the data characteristics such as the data type (such as character or numeric) and the relationships that link the data. Relationships are an important component of database design. The Data dictionary also contain entries relating to the relationships and the keys.

- 3.3 SFromAP, SToAP and PlaneID. These key values could refer to Cities (Airportcodes) and a Key value for the applicable aircraft used.
- 3.4 A database index is a data structure that improves the speed of data retrieval operations on a database table at the cost of additional writes and storage space to maintain the index data structure. Indexes are used to quickly locate data without having to search every row in a database table every time a database table is accessed. Indexes can be created using one or more columns of a database table, providing the basis for both rapid random lookups and efficient access of ordered records.

An index is a copy of select columns of data from a table that can be searched very efficiently that also includes a low-level disk block address or direct link to the complete row of data it was copied from

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**Question 4****(8)**

- 1) The initial study and
  - Analyse the company situation
  - Define the problems and the constraints
  - Define the objectives
  - Define the scope and boundaries
- 2) The database design.
  - Create the conceptual design
  - Select the appropriate DBMS
  - Create the logical designs
  - Create the physical designs

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**Question 5****(4x2)**

**The physical model** operates at the lowest level of abstraction, describing the way data are saved on storage media such as disks or tapes. The physical model requires the definition of both the physical storage devices and the (physical) access methods required to reach the data within those storage devices, making it both software- and hardware-dependent. The storage structures used are dependent on the software (DBMS, operating system) and on the type of storage devices that the computer can handle. The precision required in the physical model's definition demands that database designers who work at this level have a detailed knowledge of the hardware and software used to implement the database design.

**The internal model** is the representation of the database as "seen" by the DBMS. In other words, the internal model requires the designer to match the conceptual model's characteristics and constraints to those of the selected implementation model. An internal schema depicts a specific representation of an internal model, using the database constructs supported by the chosen database.

## Question 6

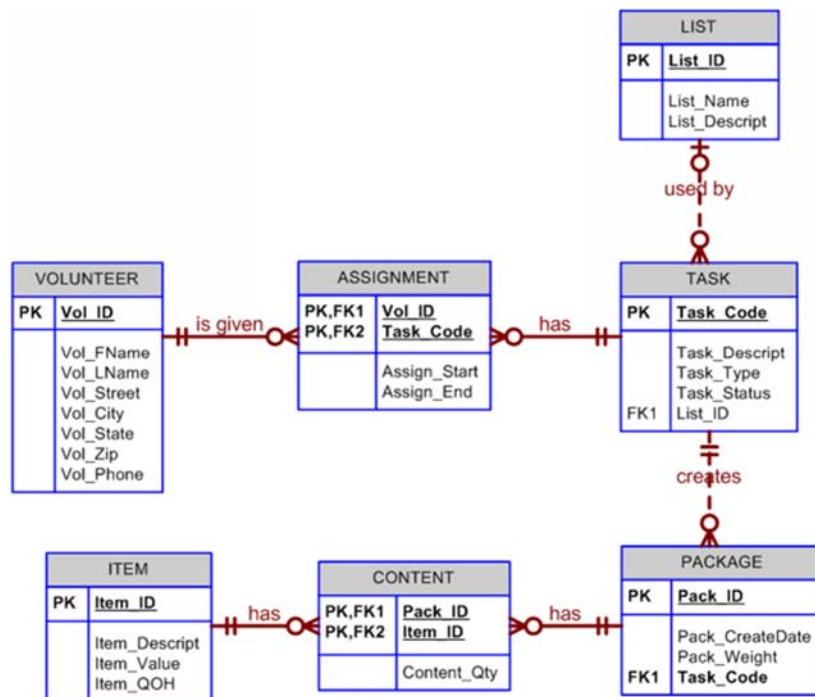
(4x2)

- 6.1 A M:N relationship cannot be implemented in a relational database model. M:N relationship must be broken up into two 1:M relationships before it can be implemented in a relational database.
- 6.2 An associative entity must be created.



## Question 7

(20)



- 1 Mark for each new entity = 4
- ½ Mark for each relationship = 2
- 1 Mark for the correct cardinality indicated = 4
- 1 Mark for indicating the correct weak relationships = 2
- 1 Mark for Foreign Keys = 3
- 1 Mark for each PK = 2

**Maximum 20 Marks**