



**Benodigdhede vir hierdie vraestel/Requirements for this paper:**

Wakkerselekte/ Multiple-choice cards:

☐

Re-programmeerbare sakrekenaar/ Re-programmable calculator:

☐

Greëfotopapier/ Open paper:

☐

Draagbare Rekenaar/ Laptop:

☐

Oopboek-examen/ Open book examination:

NEE/  
NO

EKSAMEN/TOETS  
EXAMINATION/TEST:

November 2nd  
Opportunity 2016

KWALIFIKASIE/  
QUALIFICATION:

B.Com, B.Sc, B.Sc in IT

MODULEKODE/  
MODULE CODE:

ITRW321

TYDSDUUR/  
DURATION: 3 hours + 20 min

MODULEBESKRYWING/  
MODULE DESCRIPTION:

Databases II

MAKS/  
MAX: 130

EKSAMINATOR(E)/  
EXAMINER(S):

AR BOTES

DATUM/  
DATE: 5/12/2016

PROF D JORDAAN

TYD/TIME: 14:00

MODERATOR:

PROF TANYA BEELDERS

**INSTRUCTIONS**

1. Answer all questions in the script provided.
2. Number questions clearly.
3. Write in BLUE or BLACK pen, diagrams in pencil and diagram text in pen.
4. Please write neatly; if answers cannot be read it cannot be marked.
5. Any many-to-many relationships in logical database diagrams will incur a 3 mark(-3) penalty per instance.

**QUESTION 1**

**PART A (5 Marks) - Indicate whether the statement is true or false on the choice card. (Use 1 for True and 2 for False)**

1. The database administrator must be prepared to perform routine maintenance activities within the database.
2. If the logical structure of the database should change, then the way the user views the database should not change.
3. Primary indices are placed on unique fields such as the primary key.
4. MDM's main goal is to provide a partial and segmented definition of all data within an organization.
5. Whether you purchase online or by standing in line, the system-level transaction details are essentially the same and they require the same basic database structures and relationships.

**PART B (15 Marks) - Identify the choice that best completes the statement or answers the question on the choice card.**

6. "What are the requirements of the current system's end users?" is a question asked during the \_\_\_\_\_ phase of the SDLC.
  - a. planning
  - b. analysis
  - c. implementation
  - d. maintenance

7. The conceptual design step that determines end-user views, outputs, and transaction-processing requirements is \_\_\_\_.
- a.data analysis and requirements
  - b.entity relationship modeling and normalization
  - c.data model verification
  - d.distributed database design
8. The conceptual design step that defines entities, attributes, and relationships is \_\_\_\_.
- a.database analysis and requirements
  - b.entity relationship modeling and normalization
  - c.data model verification
  - d.distributed database design
9. All transactions must display \_\_\_\_.
- a.atomicity, consistency, and durability
  - b.durability and isolation
  - c.consistency, durability, and isolation
  - d.atomicity, durability, consistency, and isolation
10. A single-user database system automatically ensures \_\_\_\_ of the database, because only one transaction is executed at a time.
- a.serializability and durability
  - b.atomicity and isolation
  - c.serializability and isolation
  - d.atomicity and serializability
11. A system table space, a user data table space, an index table space, and a temporary table space are examples of \_\_\_\_.
- a.procedure caches
  - b.file groups
  - c.data files
  - d.extends
12. When setting optimizer hints, \_\_\_\_ instructs the optimizer to minimize the time it takes to process the first set of rows, that is, to minimize the time it takes to return only the first set of rows in the query result set. This hint is generally used for interactive mode processes.
- a.ALL\_ROWS
  - b.FIRST\_ROWS
  - c.INDEX(P\_QOH\_NDX)
  - d.OPTIMIZATION\_ROWS
13. The \_\_\_\_ table space is used for transaction-recovery purposes.
- a.system
  - b.user data
  - c.temporal
  - d.rollback segment
14. The \_\_\_\_ table space is used to store the data dictionary tables.
- a.system
  - b.user data
  - c.temporal
  - d.rollback segment
15. \_\_\_\_ are an advantage of a DDBMS.

- a.Reduced operating costs      c.      Decreased storage requirements
- b.Simplicity of management and control      d.      Decreased training costs

16. The \_\_\_\_ rule requires that all copies of data fragments be identical.

- a.shared fragment      c.      horizontal fragmentation
- b.mutual consistency      d.      replication

17. In a star schema, attributes are often used to search, filter, or classify \_\_\_\_.

- a.tables      c.      facts
- b. stars      d.      dimensions

18. The reliance on \_\_\_\_ as the design methodology for relational databases is seen as a stumbling block to its use in OLAP systems.

- a.normalization      c.      star schema
- b.denormalization      d.      multidimensional schema

19. Every XML document has a \_\_\_\_.

- a.root element      c.      schema
- b.base tag      d.      DTD

20. Using \_\_\_\_, you can extract data from an XML document and convert it into a text file.

- a.XMLD      c.      DTD
- b. XSLT      d.      XML schema

### **PART C (5 Marks) - Complete each statement in your answer book.**

- 21. In multidimensional terms, the ability to focus on slices of the cube to perform a more detailed analysis is known as \_\_\_\_\_.
- 22. \_\_\_\_\_ is a higher-level object-oriented application interface used to access remote database servers.
- 23. A Web \_\_\_\_\_ server is a middleware application that expands the functionality of Web servers by linking them to a wide range of services.
- 24. \_\_\_\_\_-side data input validation is one of the most basic requirements for Web applications.
- 25. XML tags must be well formed; that is, each opening tag has a corresponding \_\_\_\_\_ tag.

### **PART D (5 Marks) - Complete Essay in your answer book.**

- 26. What is a data cube?

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### **QUESTION 2**

- 2. ABC Markets sell products to customers. The relational diagram shown below represents the main entities for ABC's database. Note the following important characteristics:

A customer may make many purchases, each one represented by an invoice.

- The CUS\_BALANCE is updated with each credit purchase or payment and represents the amount the customer owes.

- The CUS\_BALANCE is increased (+) with every credit purchase and decreased (–) with every customer payment.
- The date of last purchase is updated with each new purchase made by the customer.
- The date of last payment is updated with each new payment made by the customer.

An invoice represents a product purchase by a customer.

- An INVOICE can have many invoice LINES, one for each product purchased.
- The INV\_TOTAL represents the total cost of the invoice, including taxes.
- The INV\_TERMS can be “30,” “60,” or “90” (representing the number of days of credit) or “CASH,” “CHECK,” or “CC.”
- The invoice status can be “OPEN,” “PAID,” or “CANCEL.”

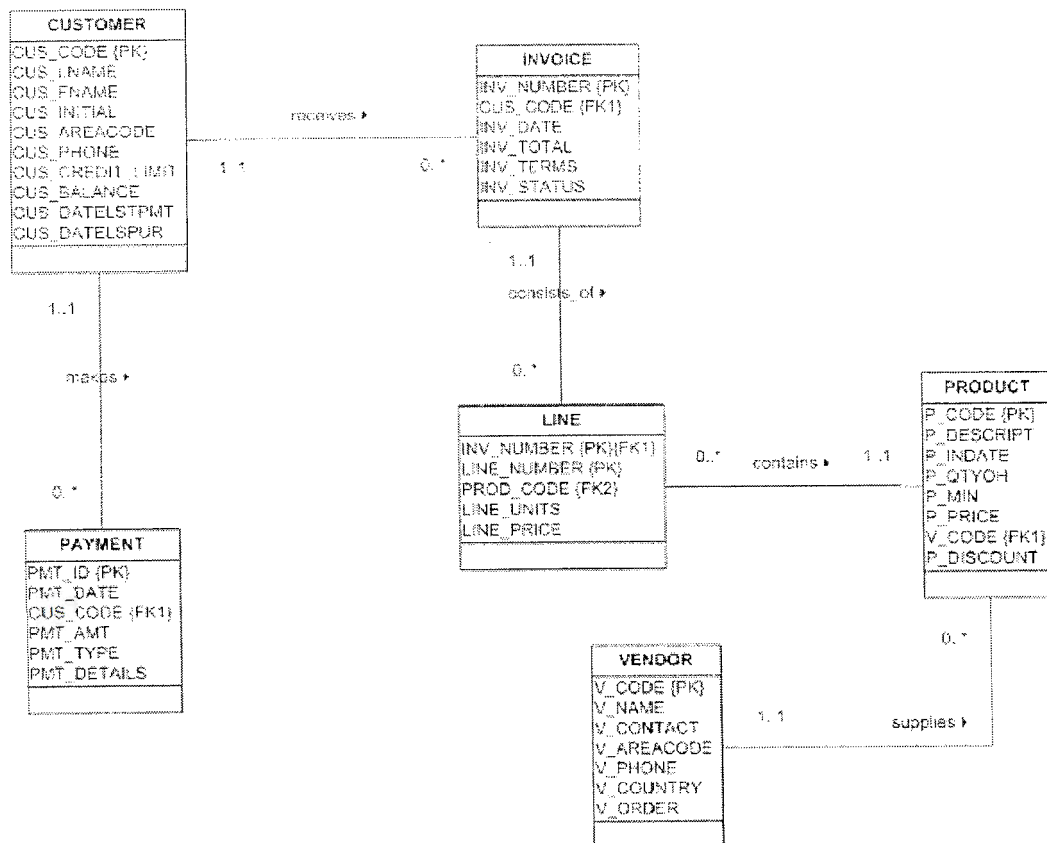
A product’s quantity on hand (P\_QTYOH) is updated (decreased) with each product sale.

A customer may make many payments. The payment type (PMT\_TYPE) can be one of the following:

- “CASH” for cash payments.
- “CHEQUE” for cheque payments.
- “CC” for credit card payments.

The payment details (PMT\_DETAILS) are used to record data about cheque or credit card payments:

- The bank, account number, and cheque number for cheque payments.
- The issuer, credit card number, and expiration date for credit card payments.



Note: Not all entities and attributes are represented in this example. Use only the attributes indicated.

2.1. Using this database, write the SQL code to represent each of the following transactions. Use BEGIN TRANSACTION and COMMIT to group the SQL statements in logical transactions.

2.1.1. On May 11, 2010, customer 10010 makes a credit purchase (30 days) of one unit of product 11QER/31 with a unit price of \$110.00; the tax rate is 8 %. The invoice number is 10983, and this invoice has only one product line. (3)

2.1.2. On June 3, 2010, customer 10010 makes a payment of \$100 in cash. The payment ID is 3428. (3)

2.2. Assuming that pessimistic locking is being used, but the two-phase locking protocol is not, create a chronological list of the locking, unlocking, and data manipulation activities that would occur during the complete processing of the transaction described in 2.1.1. (13)

2.3. Write the transaction log for the above transactions, using the table below as your template.

TRL ID	TRX NUM	PREV PTR	NEXT PTR	PERATION	TABLE	ROWID	ATTRIBUTE	BEFORE VALUE	AFTER VALUE
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(9)

[28]

### QUESTION 3

Pine Valley Furniture wants you to help design a data mart for analysis of sales. The subjects of the data mart are as follows:

Salesperson	Attributes: SalespersonID, Years with PVFC, SalespersonName, and SupervisorRating.
Product	Attributes: ProductID, Category, Weight, and YearReleasedToMarket.
Customer	Attributes: CustomerID, CustomerName, CustomerSize, and Location. Location is also a hierarchy over which they want to be able to aggregate data. Each Location has attributes LocationID, AverageIncome, PopulationSize, and NumberOfRetailers. For any given customer, there is an arbitrary number of levels in the Location hierarchy.
Period	Attributes: DayID, FullDate, WeekdayFlag, and LastDay of MonthFlag.

Data for this data mart come from an enterprise data warehouse, but there are many systems of record that feed this data to the data warehouse. The only fact that is to be recorded in the fact table is Rand Sales.

3.1. Design a typical multidimensional schema to represent this data mart. (14)

[14]

### QUESTION 4

4. The South African Vuvuzela (Pty) Ltd., wants to design a distributed relational database. The company is headquartered in Cape Town and has major operations in Durban, Johannesburg, and Pretoria. The database involved consists of five tables, labelled A, B, C, D, and E, with the following characteristics:

- Table A consists of 500,000 records and is heavily used in Cape Town and Durban.
- Table B consists of 100,000 records and is frequently required in all four cities.
- Table C consists of 800 records and is frequently required in all four cities.
- Table D consists of 75,000 records. Records 1-30,000 are most frequently used in Durban. Records 30,001-75,000 are most frequently used in Johannesburg.
- Table E consists of 20,000 records and is used almost exclusively in Cape Town.

Design a distributed database implementation for Vuvuzela (Pty) Ltd. Justify your placement of data in terms of replication, and partitioning of the tables. Indicate whether to Store, Replicate, Copy or Partition the data with respect to each location.

Redraw and use the table template below:

Table/Location	Capetown	Durban	Johannesburg	Pretoria
Table A				
Table B				
Table C				
Table D				
Table E				

[8]

### QUESTION 5

5. Draw a diagram to illustrate how web-to-CGI and web-to-API interfaces middleware function.

[14]

### QUESTION 6

6.

6.1. Evaluate the query below and answer the questions to follow:

```

SELECT L.INV_NUM, L.LINE_NUM, P.PROD_SKU, P.PROD_DESCRIPT, L2.LINE_NUM,
       P2.PROD_SKU, P2.PROD_DESCRIPT, P.BRAND_ID
FROM (LGLINE L JOIN LGPRODUCT P ON L.PROD_SKU = P.PROD_SKU) JOIN
     (LGLINE L2 JOIN LGPRODUCT P2 ON L2.PROD_SKU = P2.PROD_SKU)
ON L.INV_NUM = L2.INV_NUM
WHERE P.BRAND_ID = P2.BRAND_ID
      AND P.PROD_CATEGORY = 'SEALER'
      AND P2.PROD_CATEGORY = 'TOP COAT'
ORDER BY L.INV_NUM, L.LINE_NUM;

```

6.1.1. What indexes would you recommend? (2)

6.1.2. Write the commands required to create the indexes you recommended in question 6.1.1? (2)

6.1.3. Write the command(s) used to generate the statistics for the LGLINE table. (1)

6.2. Evaluate the query below and answer the questions to follow:

Brand_Name	Brand_Type	Prod_Sku	Prod_Descript	Prod_Price
LONG HAUL	CONTRACTOR	1964-OUT	Fire Resistant Top Coat, for Interior Wood	78.49

```

SELECT      BRAND_NAME, BRAND_TYPE, PROD_SKU, PROD_DESCRIPT, PROD_PRICE
FROM        LGPRODUCT P JOIN LGBRAND B ON P.BRAND_ID = B.BRAND_ID
WHERE       PROD_PRICE > (SELECT MAX(PROD_PRICE)
                          FROM LGPRODUCT P JOIN LGBRAND B ON P.BRAND_ID = B.BRAND_ID)

```

AND WHERE BRAND\_TYPE = 'PREMIUM')  
 AND BRAND\_TYPE <> 'PREMIUM'  
 PROD\_PRICE > 50;

6.2.1. Provided the recommendations you studied regarding query optimization, rewrite the query to produce the required results more efficiently. (4)

6.3. Evaluate the query below and answer the questions to follow:

```

SELECT      SUP_CODE, SUM (LINE_UNITS*LINE_PRICE)
FROM        SUPPLIER NATURAL JOIN INVOICE NATURAL JOIN INVOICE_LINE
WHERE       SUP_AREA = '1900'
GROUP BY    SUP_CODE;
  
```

6.3.1. Assuming that you generate 30,000 invoices per month; what recommendation would you give the designer about the use of derived attributes? (3)

6.3.2. Assuming that you follow the recommendations you gave in the previous question, how would you rewrite the query? (2)

[14]

#### QUESTION 7

7. Evaluate the given table below and demonstrate how you will display any 5 records in 1 complete XML formatted document.

1234	The Cesar Family Christmas	2009	39.95	FAMILY	2
1235	Smokey Mountain Wildlife		59.95	ACTION	3
1236	Richard Goodhope	2010	59.95	DRAMA	2
1237	Beatnik Fever		29.95	COMEDY	2
1238	Constant Companion	2010	89.95	DRAMA	
1239	Where Hope Dies	2000		DRAMA	3
1245		2008	45.49	ACTION	3
1246	What He Doesn't Know	2008	58.29	COMEDY	1

[7]

#### QUESTION 8

8. The ABC Car Service & Repair Centers are owned by the SILENT car dealer and provides services and repairs only to SILENT cars across the entire state.

Each of the three centers is independently managed and operated by a shop manager, a receptionist, and at least eight mechanics. Each center maintains a fully stocked parts inventory.

Each center also maintains a manual file system in which each car's maintenance history is kept: repairs made, parts used, costs, service dates, owner, and so on. Files are also kept to track inventory, purchasing, billing, employees' hours, and payroll.

You have been contacted by the manager of one of the centers to design and implement a computerized system. Given the preceding information, do the following:

Indicate the most appropriate sequence of activities by labeling each of the following steps in the correct order. (For example, if you think that "Interview the shop manager." is the appropriate first step, label it "1", this have been done as an example for you, therefore the next step needs to be labeled as "2".)



- a) \_\_\_\_\_ Normalize the conceptual model.
- b) \_\_\_\_\_ Obtain a general description of company operations.
- c) \_\_\_\_\_ Load the database.
- d) \_\_\_\_\_ Create a description of each system process.
- e) \_\_\_\_\_ Test the system.
- f) \_\_\_\_\_ Draw a data flow diagram and system flowcharts.
- g) \_\_\_\_\_ Create a conceptual model, using ER diagrams.
- h) \_\_\_\_\_ Create the application programs.
- i) \_\_\_\_\_ Interview the mechanics.
- j) \_\_\_\_\_ Create the file (table) structures.
- k)   1   Interview the shop manager. (Demo/NoMark)

[10]

### QUESTION 9

9. Name and describe the anomaly happening in the transaction table below:

Time	Transaction	Action	Value	Total
1	T1	Read PROD_QOH for PROD_CODE = '110ER/31'	8	8
2	T1	Read PROD_QOH for PROD_CODE = '13-Q2/P2'	32	40
3	T2	Read PROD_QOH for PROD_CODE = '1546-QQ2'	15	
4	T2	PROD_QOH = 15 + 10		
5	T2	Write PROD_QOH for PROD_CODE = '1546-QQ2'	25	
6	T1	Read PROD_QOH for PROD_CODE = '1546-QQ2'	25	(After) 65
7	T1	Read PROD_QOH for PROD_CODE = '1558-QW1'	23	(Before) 88
8	T2	Read PROD_QOH for PROD_CODE = '1558-QW1'	23	
9	T2	PROD_QOH = 23 - 10		
10	T2	Write PROD_QOH for PROD_CODE = '1558-QW1'	13	
11	T2	***** COMMIT *****		
12	T1	Read PROD_QOH for PROD_CODE = '2232-QTY'	8	96
13	T1	Read PROD_QOH for PROD_CODE = '2232-QWE'	6	102

[5]

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TOTAL: 130

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