SECTION A

Subsection A.1 -TRUE/FALSE

Nominate whether each of the following statements is true or false by writing either T (for True) or F (for False) on the answer sheet at the end of this paper.

Each question is worth 1.5 mark.

Question 1

True or False? Each row in the relational table is known as an entity instance or entity occurrence in the ER model.

Question 2

True or False? The best way to optimize performance of SQL queries is to create an index for all the columns of all the tables

Question 3

True or False? Denormalization of database tables yields better performance over the normalization process.

Question 4

True or False? Stored procedures must have at least one argument.

Question 5

True or False? An inequality condition is also known as a natural join and an equality condition is also called a theta join.

continued…

Subsection A.2 **- FILL IN THE BLANKS**

Complete the sentences below by writing your answer on the answer sheet at the end of the exam paper- using words or phrases.

DO NOT WRITE YOUR ANSWERS IN THIS EXAM PAPER.

The length of the lines in the sentences is constant and does not necessarily indicate the length of the answer to be supplied.

Each question is worth 1.5 marks

Question 6

The relational model's foundation is a mathematical concept known as a _____.

Question 7

Two types of database administration tools are _____ and Case tools.

Question 8

Once a SQL statement is transformed, the DBMS creates what is commonly known as a(n)_____plan.

Question 9

_____ are special instructions for the optimizer that are embedded inside the SQL command text.

Question 10

The _____ mode type is considered constant because it cannot be changed within the procedure

continued…

Subsection A.3 - **MULTIPLE CHOICE QUESTIONS**

Choose one answer from the given choices for each question and write your choice on the answer sheet at the end of the exam paper.

DO NOT WRITE YOUR ANSWERS IN THIS EXAM PAPER.

Each question is worth 3 marks

Question 11

_____are important because they help to ensure data integrity.

a. Attributes
b. Entities
c. Relationships
d. Constraints

Question 12

In the_____model, the basic logical structure is represented as an upside-down tree.

a. hierarchical
b. network
c. relational
d. entity relationship

Question 13

The statement `SELECT * FROM T1, T2` produces a(n)_____join.

a. cross
b. natural
c. equi-
d. full

Question 14

The PL/SQL block starts with the_____section.

a. IS
b. OPEN
c. DECLARE
d. BEGIN

Question 15

The syntax for the UNION query is_____.

a. query + query
b. UNION (query, query)
c. UNION: query query
d. query UNION query

continued…

SECTION B - **SHORT ANSWER**

Write your answers in your answer book.

Each question is worth 5 marks.

Question 16

Explain and contrast the differences and similarities between the DBA (Database Administrator) and DA (Data Administrator).

[5 marks]

Question 17

In Oracle, what is a tablespace?

[5 marks]

Question 18

Provide an equivalent (standard) Relational Algebra expression for the following SQL query.

```
SELECT A
FROM R
WHERE A IN (SELECT C FROM S WHERE F)
```

[5 marks]

Question 19

Consider the following query and answer the following questions:

```
SELECT EMP_LNAME, EMP_FNAME, EMP_AREACODE, EMP_SEX
FROM EMPLOYEE
WHERE  EMP_SEX = 'F' AND EMP_AREACODE = '615'
ORDER BY  EMP_LNAME, EMP_FNAME
```

a. To optimize the above query, what indexes should you create?
b. What is the data sparsity of EMP_SEX column? What type of index would you recommend if we needed to make an index for the EMP_SEX column? Please give a brief reason for your choice of the index.

[5 marks]

Question 20

The DBMS processes queries in three phases.

a. What are those phases?
b. Identify which phase does query optimization take place? Briefly describe the general process of query optimization.

[5 marks]

continued…

Question 21

List two advantages that PL/SQL provides in comparison to SQL.

[5 marks]

Question 22

On a database table the following five (5) triggers are created:

```
CREATE TRIGGER trg1 AFTER UPDATE……. ON EMPLOYEE
For EACH ROW
Begin
……
End

CREATE TRIGGER trg2 BEFORE UPDATE……. ON EMPLOYEE
For EACH ROW
Begin
……
End

CREATE TRIGGER trg3 AFTER UPDATE……. ON EMPLOYEE
Begin
……
End

CREATE TRIGGER trg4 BEFORE UPDATE……. ON EMPLOYEE
Begin
……
End

CREATE TRIGGER trg5 AFTER UPDATE……. ON EMPLOYEE
For EACH ROW
Begin
……
End
```

If an UPDATE operation occurs on EMPLOYEE table, please give the **firing sequence** of each trigger.

[5 marks]

Question 23

SQL injection can be a serious problem for a database based application. Please answer the following:

a. Give two ways SQL injections can be harmful to the database.
b. Give two examples of an SQL injection attack that can be used to exploit the following query used in your database application.

```
select count(*) from users
where username='$username' and password= '$password‘
```

continued…

[5 marks]

Question 24

List two (2) advantages or characteristics of a NoSQL database

[5 marks]

Question 25

What are the functions of PGA and SGA memory structures in Oracle 11g database?

[5 marks]

continued…

SECTION C

Write your answers in your answer book.

Answer ALL the questions in this section.

Each question is worth 20 marks.

Question 26

ER DIAGRAM

Draw an Entity-Relationship (ER) diagram to model the scenario below in your exam book.

Use the ER conventions for this unit. (These conventions are a simple version of crows feet ER modelling conventions).

Cyril's CD Collection

Cyril has decided to create an archive of his CDs.

He gives each of his CDs a unique identifier and he records the name of the CD, the year that the CD was released and the year that he bought it.
Each CD is created by one artist and is released by one publisher.

Cyril makes a list of the musicians who have played on the CDs that he owns.
Some musicians played on several of the CDs, and most CDs had several musicians playing on the CD.

Cyril collects information about each of the companies which released the CDs which he owns. He records:

- the name of the publisher
- the country in which the company was registered
- the date that the company was created
- the date that the company ceased to exist (where appropriate)

Cyril also has a list of the artists who created one or more of his CDs.
He gives each of the artists a unique code and records the name of the artist and any other interesting facts about the artist.
An artist may be a group (eg One Direction) or a person (eg Rain).
An artist is not the same thing as a musician.

[20 Marks]

continued…

Question 27

SQL Statements

Consider a simplified Twitter like system with the following specifications:

- Users post 'tweets', which are short pieces of text
- They may tag their tweets with zero or more tags of their own choice. For example, a user tweeting about the Gators may decide to use the tag 'Gators'.
- A user may follow zero or more other users, which means that their 'tweets' are visible to this user when he/she logs in.

Consider the following database schema (primary keys are underlined):

- Person (pname, city, ttext) – Assuming pname is unique
- Follows (pname1, pname2) – Person pname1 follows person pname2
- Tweets (tid, ttitle, ttext) – Tweet with tid has title ttitle and text ttext
- PersonTweets (pname, tid, ts) – Person pname posted tweet tid at timestamp ts
- TweetTag (tid, tagname) – Tweet tid had tagname in its list of tags

Express the following queries in **SQL Select statement.**

a. Find the persons who are following 'Obama'.
b. Find all the tags 'Obama' used in his tweets. (i.e. tweeting interests)
c. Find all the tags 'Obama' reads in the tweets of the people he follows. (i.e. reading interests)
d. Find the tweet with maximum number of tags.
e. Find all pairs of people (pname) who have at least one follower in common. (assume <, =, and > can be used for string comparison).

[20 marks]

This is the end of the exam paper

continued…

KIT712 Data Management Technology

*Answer sheet for **Section A.1***

*Your selection must be written as a CAPITAL letter in the box provided for each question. Write **T** for True. Write **F** for False*

True or False?
Question 1
Question 2
Question 3
Question 4
Question 5

*Answer sheet for **Section A.2***

Your word or phrase must be written clearly in the box provided for each question.

Question 6	
Question 7	
Question 8	
Question 9	
Question 10	

*Answer sheet for **Section A.3***

Your choice index must be written clearly in the box provided for each question.

Question 11	
Question 12	
Question 13	
Question 14	
Question 15	