SECTION A

Attempt ALL questions from Section A. This section is worth 30 marks.

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 mark.

Question 1

True or False? The entity relationship model (ERM) is dependent on the database management system.

[1 mark]

Question 2

True or False? An index scan is less efficient than a full table scan.

[1 mark]

Question 3

True or False? Each statement inside the PL/SQL code must end with a period (".").

[1 mark]

Question 4

True or False? All initialization parameters can be modified while database is running.

[1 mark]

Question 5

True or False? Left Join is equivalent to Full Outer Join.

[1 mark]

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 2 marks.

Question 6

A(n) ____ join will select only the rows with common values in the common column(s), excluding rows with unmatched values and duplicate columns.

[2 marks]

Question 7

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

[2 marks]

Question 8

A relational operator that yields values from all rows found in a table is known as the ____ operator.

[2 marks]

Question 9

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

[2 marks]

Question 10

A _____ is a minimal subset of attributes in a relation which uniquely identifies each tuple in the relation.

[2 marks]

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

What is meant by the term Union Compatibility in Relational Algebra?

a. When two tables share the same domains and number of columns
b. When two tables share the same number of columns
c. When two tables have the same degree
d. When two tables share the same (or compatible) domains

[3 marks]

Question 12

Which data model's logical structure is represented as an upside-down tree?

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

[3 marks]

continued…

Question 13

Given the following relational schema, which type of join should be used to find the name of owner (s) of a cat whose name is 'Mickey' in a SQL query?

```
Cat(CatId[PK], Name, Sex)
Owner(OwnerID[PK], OwnerName, CatId[FK])
```

a. Inner Join
b. Left Join
c. Outer Join
d. Right Join

[3 marks]

Question 14

The exception ____ refers to a SELECT statement in a PL/SQL block that retrieves no rows.

a. NO_DATA_FOUND
b. ZERO_DIVIDE
c. TOO_MANY_ROWS
d. DUP_VAL_ON_INDEX

[3 marks]

Question 15

Which of the following is the proper order of Oracle's logical storage hierarchy, from smallest to largest?

a. Tablespace, database block, segment, extent
b. Database block, extent, segment, tablespace
c. Segment, extent, database block, tablespace
d. Segment, database block, extent, tablespace

[3 marks]

continued…

SECTION B - **SHORT ANSWER**

Attempt ALL questions from Section B. This section is worth 50 marks.

Write your answers in your answer book.

Each question is worth 5 marks.

Question 16

Explain TWO (2) differences and TWO (2) similarities between the roles of a DBA (Database Administrator) and DA (Data Administrator).

[5 marks]

Question 17

In Oracle, why is it recommended to use multiple tablespaces to store database objects?

[5 marks]

Question 18

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

```
SELECT P.A, Q.B
FROM P, Q
WHERE P.A=Q.A and Q.B>5;
```

[5 marks]

Question 19

Consider the following query and answer the following questions:

```
SELECT EMP_ID, EMP_FNAME, EMP_AREACODE
FROM EMPLOYEE
WHERE  EMP_ID like '12' AND (EMP_Sal)*100 =10000;
```

a. Please identify what can cause prospective performance issues in the above query? Assume there are indexes for EMP_D and EMP_Sal columns.
b. Suggest ways by which we can overcome these issues.

[5 marks]

continued…

Question 20

The DBMS processes queries in three phases. What are those phases? Identify in which phase does query optimization take place? Briefly describe the general process of query optimization.

[5 marks]

Question 21

In PL/SQL, what is the difference in the usage of *"Select … INTO…."* and *Cursors.*

[5 marks]

Question 22

Identify 4 syntax errors in the following PL/SQL code.

```
CREATE TRIGGER check_salary
BEFORE INSERT ON employees
FOR ROW
DECLARE
  c_min number
  c_max constant number(8,2);
BEGIN
  IF :new.salary > c_max OR
     :old.salary < c_mn THEN
    RAISE_APPLICATION_ERROR(-20000,
      'New salary is too small or large');
  END IF;
END;
```

[5 marks]

Question 23

List TWO (2) differences between of NoSQL databases and Relational databases.

[5 marks]

Question 24

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

a. Give TWO (2) ways SQL injections can be harmful to the database.
b. Give TWO (2) 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';
```

[5 marks]

continued…

Question 25

In following Trigger code, clearly identify by the line numbers
a) The statements that define the timing of trigger firing,
b) The statements that define the event causing the trigger.

```
Line 1      CREATE OR REPLACE TRIGGER dis_sal_changes
Line 2      BEFORE
Line 3      INSERT OR UPDATE
Line 4      ON customers
Line 5      FOR EACH ROW
Line 6      WHEN (:NEW.ID > 0)
Line 7      DECLARE
Line 8      sal_diff number;
Line 9      BEGIN
Line 10     sal_diff := :NEW.salary - :OLD.salary;
Line 11     dbms_output.put_line(:OLD.salary);
Line 12     dbms_output.put_line(:NEW.salary);
Line 13     dbms_output.put_line(sal_diff);
Line 14     END;
```

[5 marks]

continued…

SECTION C

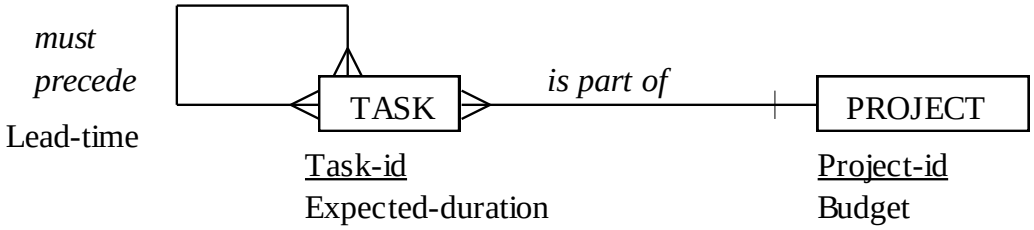
Write your answers in your answer book.

Answer ALL the questions in this section. This section is worth 40 marks.

Each question is worth 20 marks.

Question 26

Undertake the specified tasks using the following Entity-Relationship Model



Task 1

Briefly describe the business rules indicated by the relationships given in the ER model above.

[5 marks]

Task 2

Convert the ER diagram to a relational schema using the conversion algorithm from this unit. Show all of the steps in the algorithm.

ER To Relational Conversion Algorithm

Step 1: Each entity becomes a relation

Step 2: Each many-to-many relationship becomes a relation

Step 3: Each one-to-many relationship is represented by a foreign key

Step 4: Write out the final relational schema

[15 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, address)* – 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

Write **SQL Select statements** that query the data asked in the following:

a. Find the persons who are followed by 'XYZ' user.

[3 marks]

b. Find the total number of tweets posted by 'XYZ' user.

[3 marks]

c. Find all the tags that XYZ user used in his tweets.

[4 marks]

d. Find the user who posted the tweet with maximum number of tags.

[4 marks]

e. Find the names of those persons who are not following XYZ user.

[6 marks]

This is the end of the exam paper.

continued…

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*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	