AUT UNIVERSITY COMPUTER + MATHEMATICAL SCIENCES

AK3697 Bachelor of Computer and Information Sciences

FINAL EXAMINATION

PAPER DESCRIPTION: Physical Database Design

PAPER CODE: 406706

TIME ALLOWED: **2** Hours plus **5** Minutes Reading Time

TOTAL MARKS: 100

INSTRUCTIONS:

1. This is a closed book exam.
2. Answer ALL questions.
3. Write your answers in the answer booklet;
4. Write your student ID on this question paper, on the answer booklet and on any extra pages used.
5. Start each question on a new page.
6. All answers except diagrams and sketches must be in ink.
7. Correcting fluid is not permitted.
8. Electronic devices other than non-programmable calculators are not allowed.
9. If you need extra paper, ask for sheets from the examiner.

ADDITIONAL MATERIALS: NONE

QUESTION	MARKS
1	30
2	22
3	25
4	23
TOTAL	100

QUESTION 1 **30 MARKS**

a) Taking into account the assignments in this course, identify and describe the major activities involved in the assignmnet.

[14]

b) Oracle has a 4-level data storage model for Physical Design, consisting of tablespaces, segments, extents and blocks. It would seem a far simpler management task to have a 2-level structure consisting of tablespaces and blocks, with each block identifying which segment (table or index) it belongs to in the block header.
Provide a brief explanation of each level.

[10]

c) Identify values (small, medium or large) for PCTFREE and PCTUSED in each of the following situations. Justify your choice in each case. To help clarify your discussion, definitions of small, medium and large are given below for PCTFREE and PCTUSED. **[6]**

PCTFREE: (small 0 - 5%, medium 6 - 19%, Large 20 - 25%)
PCTUSED: (small 25 - 39%, medium 40 - 49%, Large 50 - 95%)

(i) An application for airports records wind speed and wind direction every 10 minutes at four locations around the airport (North, South, West, East). The information is recorded in a WindConditions table with the following columns:

Location, TimeRecorded, WindSpeed, WindDirection, Comments

where WindDirection and Comments are text-based columns. Supervisors add comments at the time that the data is recorded and may update these comments later. The records are not deleted.

(ii) A Banking application that records the details of each transaction made by its customers. Each transaction consists of Transaction#, Transaction Type (Account Enquiry, Deposit, Withdrawal or Transfer), Customer#, Time, Date, Account#1, Account#2 (needed in case of a transfer), Amount ($value needed

QUESTION 2 **22 MARKS**

a) In Oracle, developers have the choice of writing PL/SQL in different forms; Discuss each of them in details. [12]

b) The code for the procedure given below has FOUR errors (these are logic errors, not syntax errors). Identify these errors and suggest what is required to correct them. Note that you will not need to rewrite the entire code, simply rewrite the lines that are in error [10]

The procedure debit_account withdraws money from a bank account. It accepts an account number and an amount of money as parameters. It uses the account number to retrieve the account balance from the database, then computes the new balance. If this new balance is less than zero, then the procedure jumps to an error routine; otherwise, it updates the bank account. The procedure makes use of the following table:
ACCOUNT: Acct_no (PK), Acct_name, bal

```
1   PROCEDURE debit_account (p_acct_id INTEGER, p_debit_amount REAL)
2   IS
3     v_old_balance REAL;
4     v_new_balance REAL;
5     e_overdrawn EXCEPTION;
6   BEGIN
7     SELECT bal
8         INTO v_old_balance
9     FROM accts
10    WHERE acct_no = p_acct_id;
11    v_new_balance := v_old_balance;
12    IF v_new_balance > 0 THEN
13        RAISE e_overdrawn;
14    ELSE
15        SET bal = v_new_balance
16          WHERE acct_id = p_acct_id;
17    END IF;
18
19  EXCEPTION
20    WHEN e_overdrawn THEN
21          -- the error will be handled
22  END debit_account;
```

QUESTION 3 **25 MARKS**

(a) Consider the following database that keeps track of Students and their Enrolments in courses. Indexes exist on the following columns— sno column of Student table, status column of Student table, sno column of Enrolment table, and courseno column of Enrolment table.

Assume that there two semesters per year, there are on average 20 enrolments per student per year, and that 20% of students are part-timers.

Student (sno, sname, status, ……..)

Enrolment (sno, courseno, semester, …….)

Give THREE execution plans (in the form of query trees) for the query below. The query trees should indicate the access paths used and the join methods used. **[15]**

Retrieve the Sno (Student number) and Sname (Student Name) of all students whose status is part-time and who have enrolled for Semester 2.

(b) Two very commonly used Access Paths are Indexes and Clusters. Indexes can be of type B-tree or of type Bitmap.

Explain, compare and contrast them.

QUESTION 4 **23 MARKS**

a) Discuss the following operations performed on multidimensional data, using examples where necessary [8]

I. Roll up
II. Drill down
III. Slice and dice
IV. Pivot

b) Discuss Data warehouse schemas [6]

c) Using the transaction table given below and the Apriori principle identify any triples of items that occur with at least 60% frequency (i.e. occurs across 60% or more of the transactions). Show all your workings. [9]

TransId	CustId	Date	Item	Qty
11	215	7/9/09	Oil	3
11	215	7/9/09	bread	2
12	165	7/9/09	bread	2
12	165	7/9/09	juice	3
12	165	7/9/09	Banana	12
13	160	8/9/09	bread	5
13	160	8/9/09	Oil	4
13	160	8/9/09	juice	2
13	160	8/9/09	Banana	6
13	160	8/9/09	coffee	1
14	163	8/9/09	chocolate	2
14	163	8/9/09	juice	1
14	163	8/9/09	Banana	6
15	163	9/9/09	Oil	1
15	163	9/9/09	juice	2
15	163	9/9/09	bread	3
15	163	9/9/09	Banana	6