BITS Pilani, Dubai Campus, DIAC

Comprehensive Examination **Question Paper**

III Year SECOND Semester 2011-2012

Degree: B.E.(Hons.). Branch: C.S.

Course No : **CSC 352** Course Title: **Database Systems**

Date: 10/06/12 Sunday Time: 3 hours Total marks: 80 Weight-age: 40%

Data provided are complete. ***Closed Book***.

This question paper has 4 pages.

Answer **all** Questions

1) Define VALID TIME and TRANSACTION TIME in temporal databases. [4M]

2) a) In a distributed database, *define Replication* and *Fragmentation* of data.
   b) When is it useful to have *Replication of data & Fragmentation* of data ?
   [6 M]

3) Explain with an example each of the following Data Elements:
   a) Record with Variable Length Fields
   b) Record with Repeating Fields [5 M]

4) As a Database Designer, You are required to create a B+TREE-STRUCTURED INDEX (organize records using a tree-like data structure; assume that all paths from the root to a leaf in your tree are of same length and the leaf level record entries are chained together using a doubly linked list) for the given below student data. Take the IDNO as the key field. Assume that an internal node can have at the most 2 keys.

(here you have to **draw the diagram only**).

[10 M]

STUDENT DATA (*insert the keys in the given order*)

IDNO	Name	CGPA
19	AAA	7.6
47	ABC	6.5
15	CDS	8.6
39	SWE	9.2
68	MMC	9.5
12	CAN	8.3
35	TRK	8.9
56	MNS	9.4

5) Draw a **Tree** (relational algebra tree) showing the *Query Evaluation Plan*, for the following query: (the order in which the basic operations are performed)

```
SELECT S.sname
FROM Student S,enrolled E, faculty F, class C
WHERE S.snum=E.snum AND C.name=E.cname AND
C.fid=F.fid AND S.level='JR' AND F.fname = 'Ivana
Teach';
```

[10 M]

P.T.O.

6. Explain the actions of the following *Transaction Scenario* w.r.t. 2PL (2 phase locking protocol): [10 M]

Input transactions: A= 2000, B=4000

Lock_X(A) <granted>	
Read(A)	**Lock_S(A)**
A: = A-50	
Write(A)	
Lock_X(B) <granted>	
Unlock(A)	**<granted>**
	Read(A)
	Lock_S(B)
Read(B)	
B := B +50	
Write(B)	
Unlock(B)	**<granted>**
	Unlock(A)
	Read(B)
	Unlock(B)
	PRINT(A+B)

P.T.O.

7. **Project Information System** **[10 M]**

Studentmaster

idno	name	dateofbirth
001	AAA	27/10/63
004	DDD	5/6/63
002	BBB	18/5/63
005	EEE	8/3/63
003	CCC	20/4/63

Studentproject

idno	projectmarks	projectgrade
001	85	A
004	70	B
002	75	B
005	85	A
003	73	B

Write SQL queries and their **outputs** for the above schema:

a) Create the above tables.

b) List the *name* and *dateofbirth* for all students.

c) List *idno, name, projectgrade* for students who have obtained 'A' grade.

d) List the *idno, name* of the student who have got the **maximum** *projectmarks*.

8. Tabulate (*in a table)* the main characteristics of the following Normal forms: [10 M]

Normal Form	Key Characteristics
1NF	
2NF	
3NF	
4NF	
BCNF	

P.T.O.

9.Drawing an E-R Diagram [10 M]

A database has been established which contains details of a fictional University's vehicle fleet. The database contains 4 tables (*category, hire, lecturer_v and vehicle*). The tables are briefly described below.

The **category** table contains one row per vehicle hire category. Vehicles are allocated to hire categories depending on their associated usage and costs. Each row in the table contains a category code uniquely identifying the category, a brief description of the category, the base rate for the hire of a vehicle belonging to the category (in dollars) and a hire rate in dollars per kilometres travelled during the hire. The total hire fee for a vehicle is the base rate plus the distance travelled multiplied by the rate per kilometre.

The **hire** table contains one row per vehicle hire. Each row in the table contains details of the lecturer hiring the vehicle, the vehicle hired, the date the hire commenced and the vehicle's odometer reading at the start and end of the hire (in kilometres).

The **lecturer_v** table contains one row per lecturer. Each row in the table contains a lecturer number uniquely identifying the lecturer, the lecturer's name, the department they work in and their supervisor's number (who is also a lecturer).

The **vehicle** table contains one row per vehicle. Each row in the table contains a vehicles registration number uniquely identifying the vehicle, the make and model of the vehicle, and the hire category of the vehicle.

Draw an E-R Diagram for the above system.

10. Explain the following levels of abstraction in a DBMS: [5 M]

Physical level.

Logical level.

View level.

TEST II Question Paper

BITS Pilani, Dubai Campus, Academic City, Dubai.

III Year SECOND SEMESTER 2011-2012

Degree: B.E. (Hons.) Branch: C.S.

Course No : CS C352 Course Title: Database Systems

Date: 06, May, 2012 Sunday Time: 50 min. Total marks: 20

Data provided are complete. **OPEN *Book*.**

Text / Reference Book and class notes permitted.

This question paper has 3 pages.

Answer all Questions.

I. Writing of an **Optimized Query** (in relational algebra) using appropriate equivalence rule and **drawing** of the **initial expression tree and transformed expression tree (in relational algebra)**.

Consider the following relational schema:

Branch(branchname, branchcity, assets)	has 1000 records
Accounts(accountnumber, branchname, balance)	has 10000 records
Depositor(customername, accountnumber)	has 5000 records

Write the **optimized query** (in R.A.) and draw the **initial expression tree** and **transformed expression tree** (in R.A.) for each of the following scenarios:

a) Find the names of all customers who have an account at some branch located in **Madras.**

b) Find the names of all customers with an account at a **Madras** branch whose account balance is (over Rs. 10000 and below Rs. 100000). [6 M]

II. Discuss in brief the **effect** following transformations: [2 M]

a) Performing the projection as early as possible.

b) Join Ordering.

P. T. O.

III. **Writing of SQL Queries and OUTPUT** **[8+ 4M]**

A student details database containing four tables as follows:

STUDENT	(**idno,** name, dept, birthdate)
COMPUTER	(**computerid**, *idno*, chasis_slno, mfg_country)
ADDRESS	(**aid**, idno, street, city, state, typeofaddress)
PERFORMANCE	(**idno**, cgpa)

Write the following queries in SQL and also **write the output** for each query.

1. Find the **names** of all the students whose **city** is not known.
2. Show all the **distinct chasis_slno** and the **mfg_country** associated with each of them.
3. Find the names of all students who belong to the department **CS** and whose computer's **mfg_country** is **India**.
4. Find all the details of STUDENT whose **cgpa** is 7.00 and above.
5. Find all the STUDENT, COMPUTER details grouped according to **dept**.
6. List all the students whose names begin with '**a**'.
7. Find the STUDENTs who have more than one COMPUTER.
8. Find the STUDENTs who have both "Hostel" and "Home" address.

DATA SET:

STUDENT

idno	name	dept	birthdate
1	aaa	CS	12/01/1996
3	ccc	EEE	22/12/1966
2	bbb	CS	01/09/1957
4	ddd	EEE	01/10/1991
5	eee	CS	01/10/1991
7	gga	CS	20/07/1965

COMPUTER

computerid	*idno*	chasis_slno	mfg_country
t2	7	700200	UK
t4	7	200150	UK
t5	5	500400	India
t7	4	300200	India
t8	2	100100	India
t9	3	105205	India
t10	1	205305	UK
t11	7	500100	India

ADDRESS

aid	*idno*	street	city	Type of address
a1	7	agate	trichy	home
a3	5			home
a5	4	lapis	dubai	home
a7	1	ruby	bombay	home
a8	3	sapphire	calcutta	hostel
a9	2			home
a10	7	vfast	pilani	home
a11	7	beryl	trichy	hostel

PERFORMANCE

idno	cgpa
1	7
3	7.5
4	6.7
2	7.9
5	8.5
7	9.5

BITS Pilani, Dubai Campus, Academic City, Dubai.

III Year SECOND SEMESTER 2011-2012

Degree: B.E. (Hons.) Branch: C.S.

TEST I Question Paper

Course No : CS C352 Course Title: Database Systems

Date: 18, March, 2012 Sunday Time: 50 min. Total marks: 25

Data provided are complete. **Closed Book.**

This question paper has 2 pages.

Answer all Questions.

I. You are provided below with a database having 3 relations **std**, **std-cwk** and **cwk.** The columns represent the attributes of the corresponding relations.

std : student

id	name	address
001	andrew	SW5
002	lucy	W14
003	lisa	SW7
004	paul	E17
005	john	N1

cwk: coursework

code	title	Sub-date
cw01	Relational algebra	10/10/99
cw02	E-R model	22/10/99
cw03	Normalization	04/11/99
cw04	SQL	22/11/99

std-cwk: student-coursework

id	code	Marks
001	cw01	40
001	cw03	75
001	cw04	32
002	cw01	74
002	cw02	65
002	cw03	82
002	cw04	68
003	cw01	23
003	cw02	54
003	cw03	65
003	cw04	79
004	cw01	35
004	cw02	75
004	cw04	47

Using the above database, **Write** the expressions of **relational algebra** and also their **output** (result) for each of the following situations:

1. List the *name* of each student and the *title* of the courseworks he/she submitted.
2. Find the *title* of the coursework with the highest *marks.* [6 M]

P.T.O.

2 Normalize **each** one of the following Relation Schemas (FD's for each are also given. FD means functional dependency) into **3NF relations**:

i) **R** (*A, B, C, D*)
FDs: $C \rightarrow D$, $BC \rightarrow A$

ii) **R** (*W, X, Y, Z*)
FDs: $WZ \rightarrow XYZ$

iii) **R** (*S, T, U, V*)
FDs: $ST \rightarrow V$, $SU \rightarrow VT$, $T \rightarrow U$

[6 M]

3. Formally state the following **Armstrong's inference rules** (axioms) in database design:

a) Reflexivity
b) Augmentation
c) Transitivity
d) Decomposition
e) Union
f) Pseudo – transitivity [6 M]

4. Consider the following relation scheme :

EMP_DEPT(*ename, ssn, bdate, address, dnumber, dname, dmgrssn*).

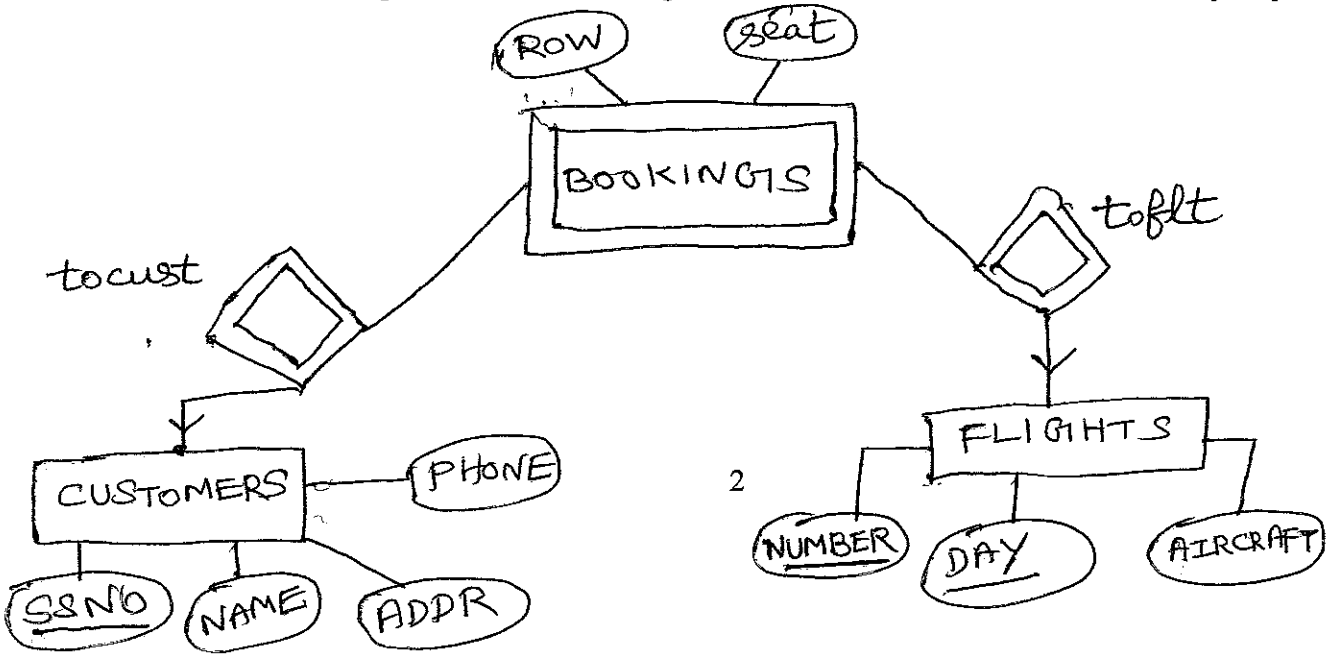
The following are the functional dependencies:

Ssn → ename, bdate, address, dnumber

Dnumber → dname, dmgrssn

List an **update anomaly**, an **insertion anamaly**, a **deletion anamaly** that may Occur for relation EMP_DEPT. [3 M]

5. Convert the given below E/R diagram to a relational database schema. [4 M]



BITS Pilani Dubai Campus, Academic City, Dubai.
III Year Second Semester 2011-2012
Degree: B.E. Hons. Branch: C.S.
QUIZ II
Course No : CS C352 Course Title: Data Base Systems
Date: 17/2/12 Tuesday Time: 20 min. Total marks: = 6
Weightage: 3% Venue : seating arrangement ***Closed Book***.
This question paper has 2 pages [use ***back page*** for ***rough work*** only]
Note: SQL assignment carries 4% weightage

IDNO: **Name:**

SET A

Write answers in the space provided in question paper. Answer all questions.

1. Define Rotational Latency w.r.t. hard disks. [1 M]

2. Distinguish between Primary Index and Secondary Index. [1.5 M]

BITS Pilani Dubai Campus, Academic City, Dubai.
III Year Second Semester 2011-2012
Degree: B.E. Hons. Branch: C.S.
*Q*UIZ II
Course No : CS C352 Course Title: Data Base Systems
Date: 17/2/12 Tuesday Time: 20 min. Total marks: = 6
Weightage: 3% Venue : seating arrangement ***Closed Book***.
This question paper has 2 pages [use ***back page*** for ***rough work*** only]
Note: SQL assignment carries 4% weightage

IDNO: **Name:**

SET A

3. What is the difference between a B-Tree and B+ Tree? [1.5 M]

4. Consider a Disk Block whose size is 1024 bytes. The record consists of two fields IDNO (string 10 chrs) and NAME (string 54 chrs). How many disk blocks are needed to store 18000 records? [2 M]

BITS Pilani Dubai Campus, Academic City, Dubai.
III Year Second Semester 2011-2012
Degree: B.E. Hons. Branch: C.S.
QUIZ I
Course No : CS C352 Course Title: Data Base Systems
Date: 28/2/12 Tuesday Time: 20 min. Total marks: = 16
Weightage: 8% Venue : seating arrangement ***Closed Book***.
This question paper has 2 pages [use ***back page*** for ***rough work*** only]

IDNO: **Name:**

SET A

Write answers in the space provided in question paper. Answer all questions.

1. What is Metadata in a database system? [2 M]

2. Expand the abbreviation ACID w.r.t. properties of transactions. [2 M]

3. What is the function of Database Administrator (DBA) ? [2 M]

4. What is the function of a Query Parser? [2 M]

5. Define the following terms in E-R diagram, in brief:
   a) Entity Set b) Attribute c) Relationships [3 M]

BITS Pilani Dubai Campus, Academic City, Dubai.
III Year Second Semester 2011-2012
Degree: B.E. Hons. Branch: C.S.
QUIZ I
Course No : CS C352 Course Title: Data Base Systems
Date: 28/2/12 Tuesday Time: 20 min. Total marks: = 16
Weightage: 8% Venue : seating arrangement ***Closed Book***.
This question paper has 2 pages [use ***back page*** for ***rough work*** only]

IDNO: **Name:**

SET A

6. Draw the E-R (entity-relationship) diagram for a Database recording the information about **teams**, **players** and their **fans**, including:

   a) For each **team**, its **name**, its **players**, its team **coach** and the *color* of its **uniform.**
   b) For each **player**, his / her name.
   c) For each **fan**, his / her **name**, favorite **teams**, favorite **players** and favorite **color**. [5 M]