



Course Title: Database 2
Date: June, 3, 2012 (Secord term)

Course Code: CSE 3321
Allowed time: 3 hrs

3rd year
No. of Pages: (3)

Remarks: (Answer the following questions... assume any missing data)

Question No. (1) (20 Marks)

Q1- A) [4 points] Specify the different types of DB failure, for each type state (exactly or approximately) (i) Frequency of occurrence (ii) Recovery time, (iii) Recovery Responsibility.

Q1- B) [4 points] When restarting the DBMS how does it know if the last shutdown was normal or due to some failure?

Q1- C) [4 points] Four transactions, TA, TB, TC and TD, are being executed concurrently on a database system when a power failure occurs. Each transaction has many entries in the log file, the first being Ent1. The end of the transaction log file had the following entries:

TA	TA	TB	TB	Check-	TC	TA	TC	TD	TA	TC	
Ent1	Ent2	Ent1	Commit	point	Ent1	Ent3	Ent2	Ent1	Rollback	Commit	FAIL

Describe what the state of the database would be after the power failure and explain how this transaction log file would be used to recover the database.

Q1- D) [4 points] If the system fails repeatedly during recovery, what is the maximum number of logrecords that can be written (as a function of the number of update and other log records written before the crash) before restart completes successfully?

Q1- E) [4 points] If a bounded amount of stable storage is used for the log, how can we ensure that there is always enough stable storage to hold all log records written during restart?

Question No. (2) (35 Marks)

Q2- A) [8 points] Based on the following relational schema and on the following update command: Answer each of the following questions:

Emp(*eid*: integer, *ename*: string, *age*: integer, *salary*: real, *did*: integer)

Dept(*did*: integer, *dname*: string, *floor*: integer)

Update EMP

Set (salary = 1.1 * EMP.salary) where EMP.ename = 'Saleh'

1. Give an example of a query that would conflict with this command (in a concurrency control sense) if both were run at the same time. Explain what could go wrong, and how locking tuples would solve the problem.

2. Give an example of a query or a command that would conflict with this command, such that the conflict could not be resolved by just locking individual tuples or pages, but requires index locking.

Q2- B) [9 points] Four transactions are presently running:

T1: RA RB RJ WA WB RD RE RG --- T2: RC RG WC RH WH RD

T3: WJ RC WC ----- T4: RG WD RJ

At some time, the lock table is as follows; Does a deadlock condition exist? Construct a wait-for graph to answer this question. If a deadlock exists, how would you resolve it?

Transaction Data Item Lock Type

T1	A	X
T1	B	X
T2	C	X
T2	G	S
T2	H	X
T3	J	X
T4	G	S
T4	D	X

Q2- C) [5 points] Let transactions T1, T2 and T3 be defined as operating on the same data item A:

T1: add one to A

T2: Double A

T3: Display A on the screen then set A to one

Suppose T1, T2 and T3 are allowed to execute concurrently. Assuming A has an initial value of zero, list all possible correct results after the three transactions have finished. (i.e., all results as if the transactions executed serially)

Q2- D) [9 points] Consider the following 3 schedules for 3 concurrent transactions T1, T2, T3

S1 = {r2(c), r2(b), w2(b), r3(b), r3(d), r3(c), r1(a), w1(a), w3(b), w3(c), r2(a), r2(d), w2(d), r1(b), w1(b), w2(a)}

S2 = {r3(b), r3(c), r3(d), r1(a), w1(a), w3(b), w3(c), r2(c), r1(b), w1(b), r2(b), w2(b), r2(a), w2(a), r2(d), w2(d)}

S3 = {r1(a), w1(a), r2(c), r2(b), w2(b), r2(d), r2(a), w2(a), w2(d), r1(b), w2(b), r3(b), r3(c), w3(b), w3(c), r3(d)}

For each of the three interleaved schedules, determine if the schedule is serialisable. If so give an equivalent serial schedule.

Q2- E) [4 points] Fill in the space

Authentication and authorization mechanisms to allow specific users access only to -----

Authentication is -----? -----! Occur (---- & -----)

Authorization: -----

Occur (-----)

From the integrity point of view it is important that data adhere to a predefined set of rules, as determined by the ---- or -----.

The term data integrity simply means that the data stored in the table is -----.

There are different types of data integrity, often referred to as -----.

What security benefits are gained by encrypting data? What drawbacks are there in encrypting data?

Question No. (3) (24 Marks)

Q3- A) [6 points] Provide the security statements to give access for the following users to the table:

PERSON (username, fullname, numDependants, occupation, salary)

- User **Khaled** RETRIEVE privileges over the entire table.
- User **bsma** INSERT and DELETE privileges over the entire table.
- User **Eslam** RETRIEVE privileges over the occupation and salary attributes only.
- Each user RETRIEVE privileges over that user's own row.
- User **fady** full privileges over rows for teachers only.
- User **gamal** DELETE privileges over rows for people in a nonspecialist occupation, where a nonspecialist occupation is defined as one belonging to more than 10 people.

Q3- B) [6 points] Integrity rules can be classified into four categories, (----,-----,----- and -----) rules.

State each of the then , Based on the previous question determine the category of the following statement

CREATE INTEGRITY RULE ATT_SR7 FORALL S (IF S.CITY = 'London' THEN S.STATUS = 20) ON ATTEMPTED VIOLATION REJECT ;	CREATE INTEGRITY RULE Tab_RX2 FORALL SCPX (FORALL SCPY (IF SCPX.S# = SCPY.Stt THEN SCPX.CITY = SCPY.CITY)) ;
CREATE INTEGRITY RULE DB_RX3 S.STATUS > 0 AND S.STATUS < 100 ;	CREATE INTEGRITY RULE DB_RX1 S.STATUS > 0 AND S.STATUS < 500 ;

Q3- C) [8 points] What is meant by Phantom Record, give an example, how can we avoid such phenomena?

Question No. (3) (24 Marks)

Q4- A) [9 points] For the following schema;

Employees(*eid*: integer, *did*: integer, *sal*: real) –
Departments(*did*: integer, *mgrid*: integer, *budget*: integer)

They are now stored in a distributed DBMS with all of Employees stored at Cairo and all of Departments stored at ALX. Each relation contains 20-byte tuples, and the *sal* and *budget* fields both contain uniformly distributed values in the range 0 to 1,000,000. The Employees relation contains 400,000 Bytes, the Departments relation contains 200,000 pages, Consider the query:

```
SELECT *  
FROM Employees E, Departments D  
WHERE E.eid = D.mgrid
```

The query is posed at Mans, and you are told that only 1 percent of employees are managers. Find the cost of answering this query using each of all the possible plans: Which plan minimizes shipping costs? Is it necessarily the cheapest plan? Which do you expect to be the cheapest? Suppose that you have a network with the following characteristics (assume any Missing Data)

Mans to ALX	(data rate 10 M bit/sec, access delay 0.1 sec).
Mans to Cairo	(data rate 20 M bit/sec, access delay 0.1 sec).
ALX to Cairo	(data rate 30 M bit/sec, access delay 0.1 sec).

Q4- B) [3 points] Describe the relation between Normalization and both types of fragmentation?

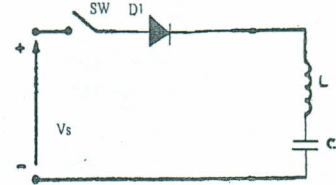
Q4- C) [4 points] For a given relation R with size M (Byte), that is horizontally divided equally among 3 sites, which are connected via LAN with the D (bit/sec) data bit rate. Give a suitable formula(s) which help in calculating the time needed to achieve a query submitted from one of these sites, or another one.

Q4- D) [8 points] Constructs a precedence graph, For the following schedule S {R2(z), R2(Y), R2(Y), R3(Y), R3(z), R1(X), W1(x), W3(Y), W3(z), R2(X), R1(Y), W1(Y), W2(X)}, Then determine its Serializability

[1-a] Write short notes on:

- * types of thyristors.
- * Snubber circuit.
- * Applications of thyristors.

[1-b] A diode circuit with an LC load is shown ,
having a capacitance of $20 \mu\text{F}$, an inductance
of $80 \mu\text{H}$, and the supply voltage $V_s = 220 \text{ V}$.
If the switch SW is closed at $t=0$,



- * derive an expression for the load current .
- * calculate the conduction time of the diode .
- * sketch both the load current, and its rate of change waveforms.

[2-a] Discuss the power factor improvement techniques?

[2-b] For a single phase semiconverter with a purely resistive load , Determine :

- * an expressions for both the average , and the rms output voltage .
- * the rectification efficiency if the delay angle $\alpha = 30^\circ$
- * the form factor FF , and the ripple factor RF .

[3-a] Discuss the theory of operation of thyristor commutation techniques?

[3-b] A single-phase ac voltage unidirectional controller has a resistive load of $R = 10 \Omega$,
and the input voltage $V_s = 120 \text{ V(rms)}$ at 60 Hz . The delay angle of the thyristor is
 $\alpha = 60^\circ$. Determine :

- * the average output voltage .
- * the rms value of output voltage .
- * the input power factor .

[4-a] What are the differences between?

- * GTO and TRIAC.
- * Step down and Step up dc chopper.
- * bidirectional and unidirectional controllers .

[4-b] A step-down chopper with a purely resistive load of $R = 10 \Omega$ and the input voltage is
 220 V . When the chopper switch remains on , its voltage drop is 2 V and the
chopping frequency is 1 KHz . If the duty cycle is 60% Determine :

- * the average and rms output voltage .
- * the chopper efficiency .
- * the effective input resistance.

GOOD LUCK

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