

Matric No: \_\_\_\_\_

**NAPIER UNIVERSITY**  
**SCHOOL OF COMPUTING**  
**CO22001**  
**DATABASE SYSTEMS (MALAYSIA)**

ACADEMIC SESSION: 2003-2004

EXAMINATION DIET: NOVEMBER 2004

EXAMINATION DURATION: 2 HOURS

READING TIME: NONE

**EXAM PAPER INFORMATION**

Number of pages – TWENTY-THREE

Number of questions – FORTY

Select ONE from (a) to (e)

Answers must be inserted on the EDPAC answer sheet provided using an HB pencil.

For full instructions see next page.

EXAMINER: DR. G. RUSSELL

**PLEASE READ THE FULL INSTRUCTIONS BEFORE COMMENCING WRITING**

## Instructions to Candidates -

**Write** the following details in the top of the **Candidate Name** section **in this order**:

Your surname

Your Initials

In the machine readable part of the name section, make a **horizontal mark between the two brackets** on the letter of your choice to enter the following details in **machine readable form in this order**:

Your surname

Your initials

e.g. [C] [H] [E] [S] [N] [E] [Y] [F]

In the box named **Candidate Number** mark in your **matriculation number**.

In the box named **Subject Code**, mark in **001**

Leave the subject box blank.

At the end of the test, return **your answer sheet** to the invigilator.

Attempt **all** of the following questions. The test consists of 40 multiple choice questions.

All the questions offer five options. For each you are required to indicate which you consider the single most appropriate answer. Indicate your selection by making a mark in the row on the answer sheet corresponding to the question number. Use an HB pencil and make a mark the width of the column (A - E), which corresponds to your chosen answer. To change an answer put the mark in the new column and **circle** the correction.

1. When implementing security in a DBMS, which of the following is NOT supported by the GRANT command.
- a. Changing passwords.
  - b. Providing DELETE privileges.
  - c. Supporting the devolution of access control to non-DBAs.
  - d. Removing privileges of other people.
  - e. Providing SELECT privileges.

Mark: (1)

2. If a system can enforce referential integrity, then this ensures that
- a. a record can never contain a null value for a foreign key attribute.
  - b. a record is always referred to from another record
  - c. a foreign key attribute in a record always refers to another record which does not contain nulls
  - d. a non-null foreign key attribute always refers to another record
  - e. a foreign key attribute in a record always refers to another record which contains nulls

Mark: (1)

3. Given the following relation and dependencies, state which normal form the relation is in.

$R(\underline{p,q},r,s,t)$   
 $p,q \rightarrow r,s,t$   
 $r,s \rightarrow p,q,t$   
 $t \rightarrow s$

- a. Unnormalised
- b. First normal form
- c. Second normal form
- d. Third normal form
- e. BCNF

Mark: (1)

4. The relation W is to be normalised to BCNF. Select the best resulting relations of that process.

$W(\underline{a}, \underline{b}, c, d, e)$

$c \rightarrow a$

a.  $W(\underline{b}, c, d, e)$

$W1(\underline{c}, a)$

b.  $W(\underline{a}, \underline{b}, c, d, e)$

$W1(\underline{c}, a)$

c.  $W(\underline{c}, \underline{b}, d, e)$

$W1(\underline{c}, a)$

d.  $W(\underline{a}, \underline{b}, d, e)$

$W1(\underline{c}, a)$

e. None of the above

Mark: (1)

5. A golf club proposes to hold a database about members, instead of the current paper-based card system. (Please note that understanding of golf terms and/or any particular field is not assumed or indeed necessary). The current membership cards hold the following fields:

Member Details:

Name, DOB, Category, Handicap, BufferValue, Increment, Decrement, Home Club, Yardage, SSS

The following functional dependencies are identified:

**FD1:** Name, DOB => Handicap, HomeClub

**FD2:** DOB => Category  
(i.e. Junior, Ordinary, Senior or Veteran etc.)

**FD3:** Handicap => BufferValue, Increment, Decrement  
(The SGU Handicap system)

**FD4:** Yardage => SSS  
(The Standard Scratch Score - an indication of the difficulty of the course based on its total length in yards.)

From this a third normal form of the relations has been produced which involves the following relations:

Member	concerns each individual member
Categories	concerns each type of membership
Handicap	concerns each class of golfer
Yardage	concerns each class of golf course

Select the appropriate description of the Handicap relation

- Handicap: Name, DOB, Handicap
- Handicap: BufferValue, Increment, Decrement, Handicap
- Handicap: Handicap, BufferValue
- Handicap: Handicap, Name, DOB
- Handicap: Handicap, BufferValue, Increment, Decrement

Mark: (1)

6. Which normalisation transformation corresponds to "Eliminating partial key dependencies"?
- Unnormalised to 1NF
  - 1NF to 2NF
  - 2NF to 3NF
  - 3NF to BCNF
  - None of the above

Mark: (1)

7.

job		
reference	employer	salary
01	Napier	£20000
02	GCHQ	£22000
03	Napier	£24000

requirement	
job	skill
01	Unix Admin
01	Oracle Admin
02	Unix Admin
02	Number Theory

The table requirement was created using the following SQL statement:

```
CREATE TABLE requirement (
  job INTEGER,
  skill VARCHAR(50),
  FOREIGN KEY job REFERENCES job(reference));
```

Select the true statement concerning the requirements table.

- it must be created BEFORE the job table
- the value 'Windows 2000 Admin' is NOT permitted for the skill attribute
- referential integrity checks will prevent invalid values for job
- it cannot store a field with a NULL value for job
- referential integrity checks will prevent identical rows being inserted

Mark: (1)

8. Continuing from the previous question.

Select the term which best describes the cardinality of the relationship between the table job to the table requirement.

- a. one to one
- b. some to many
- c. many to one
- d. many to many
- e. one to many

Mark: (1)

9. Continuing from the previous question

Which of the following show appropriate primary keys for the tables?

- a. job(reference, employer, salary) requirement(job, skill)
- b. job(reference, employer, salary) requirement(job, skill)
- c. job(reference, employer, salary) requirement(job, skill)
- d. job(reference, employer, salary) requirement(job, skill)
- e. job(reference, employer, salary) requirement(job, skill)

Mark: (1)

10.

Departments		Employees		WorkFor	
DepNo	Depname	Empno	Empname	Empno	Depno
1	Computng	1	Gordon	1	1
2	Electrical	1	Ken	3	2
3	Geography	1	Brian	4	1
4	History	1	Colin	3	3
5	Business	1	George	1	2
				2	5

Using the SQL Scenario, what is the CARDINALITY of the relationship between the entity type departments and the entity type WorkFor?

- a. N:1
- b. 5
- c. 2
- d. M:N
- e. 1:N

Mark: (1)

11. Continuing from the previous question.

Using SQL Scenario 1, which of the following SQL queries gives the number of employees in each department?

- a. 

```
SELECT depname,COUNT(*)
FROM departments,workfor
WHERE departments.depno = workfor.depno
GROUP BY depno
;
```
- b. 

```
SELECT depname,COUNT(empno)
FROM departments,workfor
WHERE departments.depno = workfor.depno
GROUP BY depname
;
```
- c. 

```
SELECT depname,COUNT(empno)
FROM departments,employees,workfor
WHERE departments.depno = workfor.depno
AND workfor.empno = employees.empno
GROUP BY depno
;
```
- d. 

```
SELECT depname,COUNT(depno)
FROM departments,employees,workfor
WHERE departments.depno = workfor.depno
AND workfor.empno = employees.empno
;
```
- e. None of the above.

Mark: (1)

12. The role of a DBA includes which of the following topics?

- a. Loading data, evaluating new database systems, performance monitoring
- b. Installing databases, C++ programming, user support.
- c. security, system testing, java programming
- d. Supporting all programming languages which might be used with a database.
- e. user interfaces, salary budgeting, performance monitoring.

Mark: (1)

13. The Data Dictionary of a DBMS can be used for a variety of tasks. Which of the following is NOT ONE OF THESE?

- a. Data analysis
- b. Improved Documentation
- c. Invoicing
- d. Costing Change
- e. Enforcement of standards

Mark: (1)

14. In the ANSI/SPARC three level database model, the external view is best described by which one of the following options?

- a. It is the place where the users interface to the DBMS.
- b. It is the place where the storage structures link to the database.
- c. It is the link between users and the storage structures.
- d. It is dependent on the underlying DBMS product used (e.g. Oracle, DBASE).
- e. It is not part of the model.

Mark: (1)

15. In Enhanced ER diagrams, a subclass

- a. may contain many superclasses.
- b. can only exist in Chen's notation.
- c. may contain only one superclass.
- d. Is part of Chun's notation.
- e. is contained in one superclass.

Mark: (1)

## 16. Films Database

Consider the following database:

MOVIE(id,title,yr)

ACTOR(id,name)

CASTING(movieid,actorid)

Identify the SQL command which will return the titles of all 1959 Marilyn Monroe films.

a. The following SQL...

```
SELECT title FROM movie,casting,actor
WHERE  movieid = movie.id
AND   actor.id = actorid
AND   name    = 'Marilyn Monroe'
AND   yr     = 1959
;
```

b. The following SQL...

```
SELECT title FROM movie,casting,actor
WHERE  movieid = movie.id
AND   name    = 'Marilyn Monroe'
;
```

c. The following SQL...

```
SELECT title FROM movie,actor
WHERE  name    = 'Marilyn Monroe'
AND   yr     = 1959
;
```

d. The following SQL...

```
SELECT title FROM movie,casting,actor
WHERE  movieid = movie.id
AND   actor.id = actorid
AND   movie.yr = casting.yr
AND   name    = 'Marilyn Monroe'
AND   yr     = 1959
;
```

e. None of the above

Mark: (1)

17. Which of the following is part of the ANSI/SPARC three level architecture model?

- a. contextual
- b. client
- c. coaxial
- d. contactable
- e. conceptual

Mark: (1)

18. Select the TRUE statement related to the following SQL:

```
SELECT X.a, X.b
FROM foo X, foo Y
WHERE X.b = Y.b AND Y.a='bar';
```

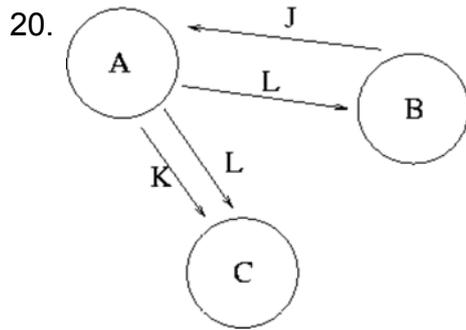
- a. the statement is NOT valid SQL.
- b. the result MUST include row with 'bar' in it.
- c. a and b are both tables.
- d. foo is an alias for X.
- e. this is an example of a self-join.

Mark: (1)

19. In the ANSI-SPARC three level architecture, which of the following is the name of one of the levels?

- a. attribute
- b. internal
- c. constructional
- d. extra
- e. index

Mark: (1)



The graph in the Transaction Scenario was produced from the following schedule time:

time	Transaction A	Transaction B	Transaction C
1		WRITE(J)	
2	READ(J)		
3	WRITE(K)		
4			READ(K)
5	WRITE(L)		
6		READ(L)	
7			READ(L)
8	COMMIT		
9		COMMIT	
10			COMMIT

Compare the precedence graph to the transaction schedule, and select the TRUE statement from the following:

- One or more of the arrows are pointing the wrong way
- The precedence graph is accurately drawn
- One or more of the loops are missing
- The circles should contain the attributes, and the loops labeled with the transaction names.
- Errors in BOTH loops and arrow direction

Mark: (1)

21. Given the following transaction schedule:

time	TRANSACTION 1	TRANSACTION 2	TRANSACTION 3
t1	read(A)		
t2		read(B)	read(B)
t3	read(B)		
t4		write(C)	
t5			write(B)
t6			read(A)
t7			write(A)
t8	write(A)		
t9	write(C)		

Which of the following precedence graphs depicts the above scenario?

- a.
- b.
- c.
- d.
- e. None of the above.

Mark: (1)

22. In the acronym ACID, used to describe the important properties of transactions, what does the letter A stand for?

- a. Atomic
- b. Also
- c. Action
- d. After
- e. None of the above

Mark: (1)

23. Which of the following is a good example of what is meant by serialisability.

- a. All disk access happens one after another.
- b. The situation where the Lost Update problem exists.
- c. All transactions happen one after another.
- d. The situation where a cascade abort occurs.
- e. The result of the transactions is the same as if the transactions went one after another.

Mark: (1)

24.

Relation P		Relation Q	
CoIW	CoIX	CoIY	CoIZ
A	4	B	7
B	5	D	4
C	6	C	6

Consider the relations P and Q above. Select the number of rows in the table resulting from the following join.

P RIGHT OUTER JOIN<sub>CoIX = CoIZ</sub> Q

- a. 2
- b. 7
- c. 4
- d. 3
- e. None of the above.

Mark: (1)

25. Table A

Col1	Col2
A	1
B	3
C	4

Table B

Col3	Col4
A	1
C	4
D	5
E	3

Consider the tables A and B shown above and select the result of A LEFT OUTER JOIN  $col1 = col3$  B

a.

Col1	Col2	Col3	Col4
A	1	A	1
C	4	C	4

b.

Col1	Col2	Col3	Col4
A	1	A	1
B	3		
C	4	C	4
		D	5
		E	3

c.

Col1	Col2	Col3	Col4
A	1	A	1
C	4	C	4
		D	5
		E	3

d.

Col1	Col2	Col3	Col4
A	1	A	1
B	3		
C	4	C	4

e. None of the above

Mark: (1)

26. Continuing from the previous question.

Consider the tables A and B shown above and select the result of  
 $A \text{ JOIN}_{\text{col1} = \text{col3}} B$

a.

Col1	Col2	Col3	Col4
A	1	A	1
B	3		
C	4	C	4

b.

Col1	Col2	Col3	Col4
A	1	A	1
B	3		
C	4	C	4
		D	5
		E	3

c.

Col1	Col2	Col3	Col4
A	1	A	1
C	4	C	4

d.

Col1	Col2	Col3	Col4
A	1	A	1
C	4	C	4
		D	5
		E	3

e. None of the above

Mark: (1)

27. Relation C is a projection of relation A. Which of the following statements must be **true in all cases** where relation C is different from relation A?

- a. The cardinality of C is greater than the cardinality of A
- b. The arity of C is less than the arity of A
- c. The arity of C is greater than the arity of A
- d. The cardinality of C is less than the cardinality of A
- e. None of the above

Mark: (1)

28. Using SERIAL data organisation -

- a. new records are written in primary key order
- b. new records can only overwrite old records
- c. new records are written randomly
- d. new records are written after the last record
- e. new records are written in candidate key order

Mark: (1)

29. Indexes speed up data access. Select the TRUE statement.

- a. Primary indexes can have duplicate keys.
- b. Primary indexes may have null values.
- c. Columns which are frequently modified are good candidates for indexing.
- d. Secondary indexes must have unique keys.
- e. None of the above.

Mark: (1)

30. An athletics meeting involves several competitors who participate in a number of events. The database is intended to record who is to take part in which event and to record the outcome of each event. As results become available the winner attribute will be updated with the cid of the appropriate competitor.

Competitor(cid, name, nationality)

Event(eid, description, winner)

Competes(cid, eid)

Competitor			Event			Competes	
cid	name	nationality	eid	description	winner	cid	eid
01	Pat	British	01	running		01	01
02	Hilary	British	02	jumping		02	01
03	Sven	Swedish	03	throwing		03	02
04	Pierre	French				04	02
						04	03

The actual database is to contain several million competitors and nearly one hundred thousand events. The database must be indexed for producing fast results for two particular queries:

- (X) A list of the names and nationalities of the competitors for a given event where the event description is given.
- (Y) A list of event descriptions for a given competitor where the cid is given.

Which of the following is not required?

- a. An index on cid in Competes
- b. An index on description in Events
- c. An index on eid in Competes
- d. An index on name in Competitors
- e. An index on eid in Event

Mark: (1)

31. The purpose of Embedded SQL is to allow

- a. Programming language to be embedded in SQL
- b. SQL queries to be executed as part of a programming language.
- c. Databases to be embedded in SQL
- d. Programs to be embedded in a database.
- e. None of the above

Mark: (1)

32. Select the TRUE statement.

- a. SQL is embedded within a C++ program to increase the speed of the C++ program.
- b. SQL embedded in C++ provides facilities to extract data from a database.
- c. SQL cursors indicate the next line of code to be executed in a C++ program.
- d. SQL is embedded to make C++ programs more efficient.
- e. SQL is embedded within C++ to handle sequential file processing.

Mark: (1)

33. Which of the following is a type of lock which cannot be obtained in Oracle.

- a. Insert lock
- b. Exclusive Lock
- c. Read lock
- d. Shared Lock
- e. Write Lock

Mark: (1)

34. Locking can be fine grained or coarse grained. Select the TRUE statement.

- a. Course grained locking improves parallelism.
- b. Only fine grained locking results in enforcing serializability.
- c. Fine grained locking is more expensive to implement.
- d. Only course grained locking results in enforcing serializability.
- e. Fine grained locking is cheaper to implement.

Mark: (1)

35. Select the problem that can occur due to introducing locks in a concurrent transaction scenario.

- a. Transaction rollover
- b. Hash key clash
- c. Loss of integrity
- d. Performance degradation
- e. None of the above.

Mark: (1)

36. When mapping EER superclasses/subclasses, which of the following options is not a valid possibility?

- a. Use one relation for the superclass
- b. Use a relation for the superclass and a separate relation for each of the subclasses.
- c. Map each subclass onto separate relations
- d. Map each subclass using class inheritance
- e. All of the above are valid options.

Mark: (1)

37. When mapping ER models into relations, which of the following is NOT true?

- a. Each individual entity is mapped into a row of the corresponding relation.
- b. Each attribute is mapped into a column of the corresponding relation.
- c. Each m-n relationship is mapped into a new relation.
- d. Each 1-m relationship is mapped into a new relation.
- e. Each entity type is mapped into a relation.

Mark: (1)

38. What is the highest normal form by which the following relation can be classified?

Delivery(Itemno, CustomerId, Quantity, CustomerTelno)

Given

Itemno, CustomerId -> Quantity, CustomerTelno

CustomerId -> CustomerTelno

- a. 2NF
- b. 3NF
- c. 1NF
- d. BCNF
- e. Unnormalised

Mark: (1)

39. Aborting a transaction

- a. Removes changes made so far in the current transaction.
- b. Results in deadlock
- c. Deletes the database for security reasons
- d. Is only possible in Microsoft Access
- e. Removes changes made in a transaction after it has committed.

Mark: (1)

40. During Rollforward, which of the following is not true?

- a. Committed transactions in the log are reapplied.
- b. Only once the rollforward has been completed can new transactions be performed.
- c. Transactions which are in the log but not yet committed are restarted where they left off.
- d. Committed transactions are reapplied in the same order as they appear in the log.
- e. Transactions which are reapplied are reapplied to the image as it was since the last checkpoint.

Mark: (1)

Total marks [40]

**END OF PAPER**