Higher National Diploma in Information Technology
Second Year, First Semester Examination – 2016
HNDIT2321- Advanced Database Management System
Model Answers

Q1.   **(Total 20 marks)**

(i).   What are the distinct paths used to develop Object-Database Systems?   (02 marks)

Object-database systems have developed along two distinct paths.
- **Object-oriented database systems**
  - OODBMS:
  - Abandon SQL (use an OO language instead)
- **Object-relational database systems**
  - ORDBMS:
  - Extend SQL (with OO features)

(ii).   What is the purpose of having database system in an institution?   (04 marks)

Earlier database applications were built on top of traditional file systems
Drawbacks of using file systems to store data:
- Data redundancy and inconsistency
- Difficulty in accessing data
- Data isolation
- Integrity problems
- Poor enforcement of standards
- Excessive program maintenance
- Atomicity of updates
- Concurrent access by multiple users
- Security problems

Database systems offer solutions to all the above problems

(iii).   List the advantages of database when using it in an enterprise.   (03 marks)

- Minimum data redundancy
- Consistency
- Integration of data
- Independence of data
- Data Sharing
- Enforcement of standards
- Ease of application development
- Uniform security, privacy and integrity control
- Flexibility, data accessibility and responsiveness
- Reduce program maintenance

(iv).   List and briefly describe the components of database environment?   (05 marks)

- **Hardware**
  - Can range from a PC to a network of computers.
- **Software**

DBMS, operating system, network software (if necessary) and also the application programs.

- **Data**
  Used by the organization and a description of this data called the schema.
- **Procedures**
  Instructions and rules that should be applied to the design and use of the database and DBMS.
- **People**
  Data Administrator (DA), Database Administrator (DBA), Database Designers (Logical and Physical), Application Programmers, End Users (naive and sophisticated)

(v). Give the pictorial explanation of Three-Level ANSI-SPARC Architecture in a simplified database environment   (06 marks)

ANSI-SPARC Three-Level Architecture

Database Systems
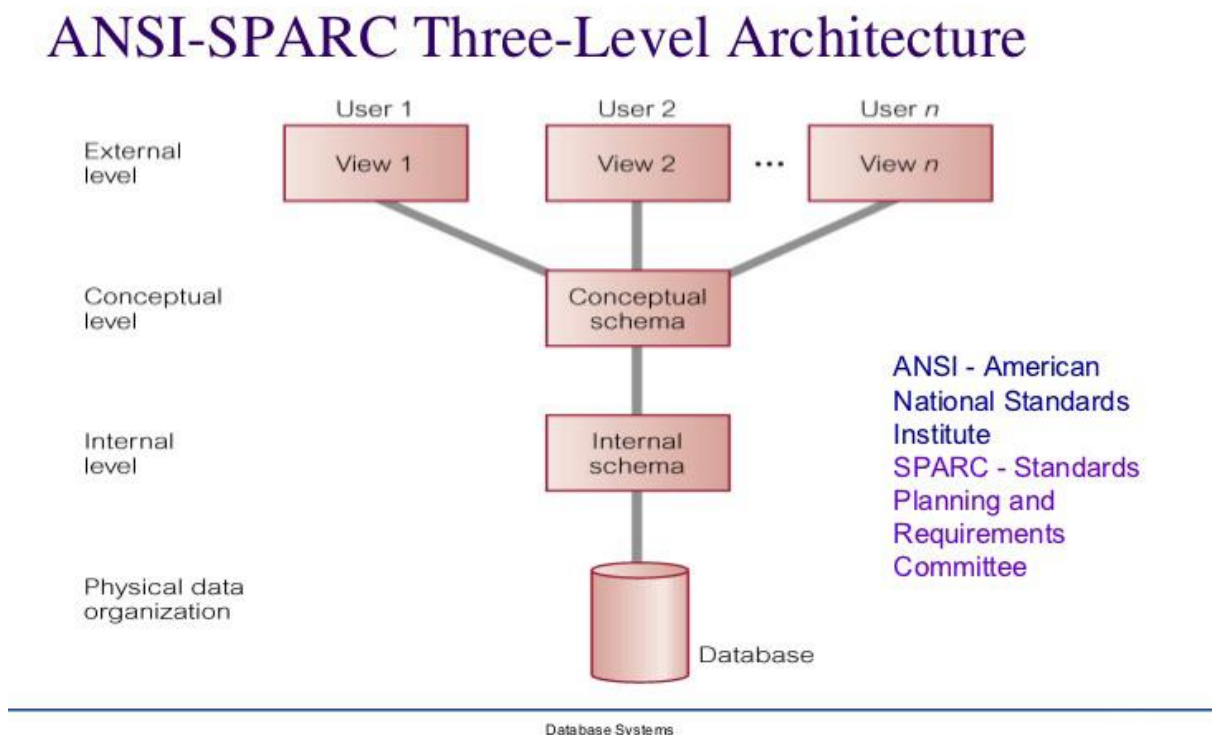
Q2. (Total 20 marks)

(i). Draw a complete Entity Relationship (ER) model for a college database to satisfy the following requirements. Propose suitable attributes and identify key attribute/s for each entity.   (14 marks)

- A college contains many departments
- Each department can offer any number of courses

- Many instructors can work in a department
- An instructor can work only in one department
- For each department there is a Head
- An instructor can be head of only one department
- Each instructor can take any number of courses
- A course can be taken by only one instructor
- A student can enroll for any number of courses
- Each course can have any number of students
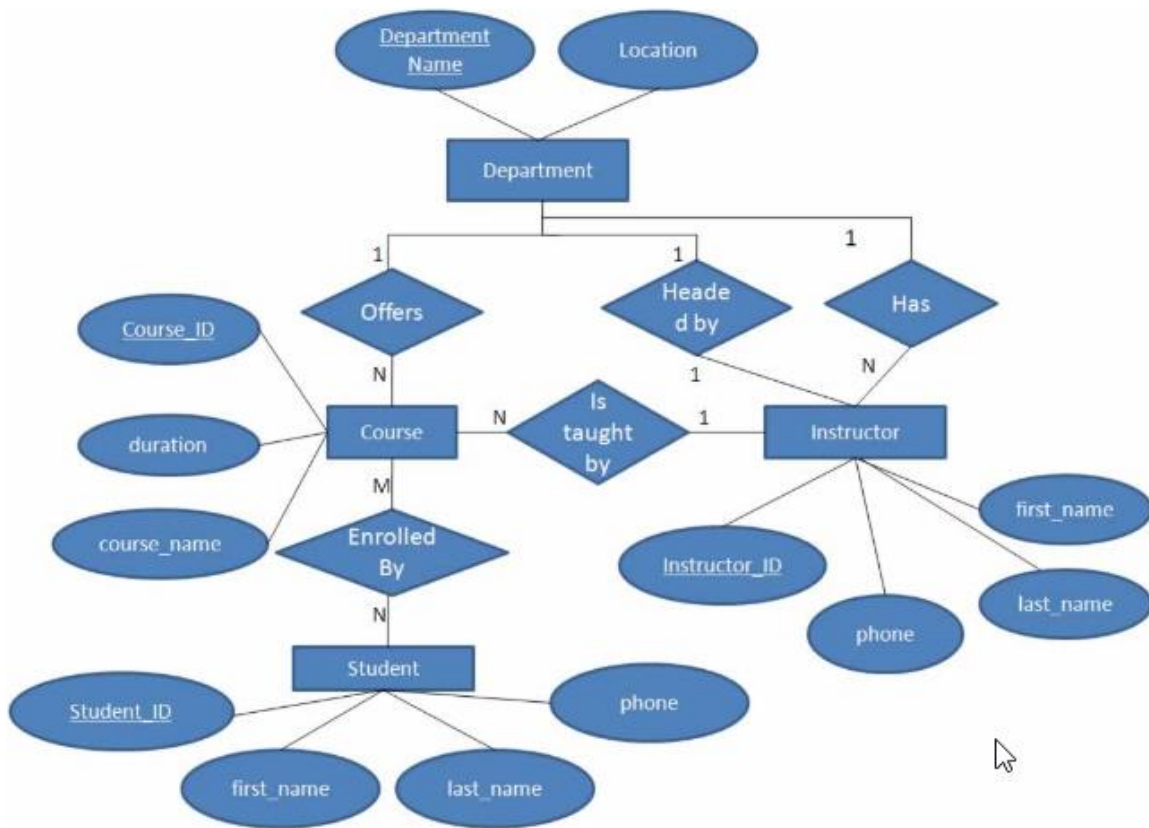
Each entity 1*4 = 4 marks

Correct attributes in each entity 1*4 = 4 marks

Correct relationships 1*5 = 5 marks

All are correct 1 mark

(ii). A company stores employee records in the format shown below. Two such employee records are as follows.

Employee ID: E05	Name: Fred Shred		Job Title: Manager
Branch Code: B04	Branch Name: London		
Qualification	Level		Year Obtained
BSc	Undergraduate		1986
PhD	Postgraduate		1990

Employee ID: E07	Name: Jim Brown		Job Title: Assistant
Branch Code: B04	Branch Name: London		
Qualification	Level		Year Obtained
BSc	Undergraduate		1995

a. Identify the repeating group of attributes and transform the above unnormalised table into tables that are in 1st Normal Form. (02 marks)

Employee(**EmployeeID**, Name, JobTitle, BranchCode, BranchName)

Qualified(**EmployeeID*, Qualification**, Level, Year)

b. Identify any partial dependencies and transform into tables that are in 2 nd Normal Form.
(02 marks)

Employee(**EmployeeID**, Name, JobTitle, BranchCode, BranchName)

Qualified(**EmployeeID*, Qualification***, Year)

QualLevel(**Qualification**, Level)

c. Identify any transitive dependencies and transform into tables that are in 3rd Normal Form. (02 marks)

Employee(**EmployeeID**, Name, JobTitle, BranchCode*)

Branch(**BranchCode**, BranchName)

Qualified(**EmployeeID*, Qualification***, Year)

QualLevel(**Qualification**, Level)

Q3. (Total 20 marks)

(i). Create the following tables using SQL statements. (14 marks)

Students (sid:char(10), sname:varchar(20), address:varchar(20), contactNo:integer,cId)

Course(cID:char(5), cname:varchar(15), duration:integer, language :varchar(20))

(ii).   Write down SQL statement to add a column to store the e- mail of the Student
Table

(03 marks)

ALTER TABLE students ADD e-mail VARCHAR(40)

(iii).   Write down SQL statement to delete the column language in Course Table.

(03 marks)

ALTER TABLE students DROP column Language

Q4. (Total 20 marks)

Employee

eno	Ename	job	dno
E001	Gihan	HR assistant	1
E002	Dilan	IT Manager	2
E003	Sunil	Software Engineer	2

Department

dno	dname	budget
1	HR	2000 000
2	IT	6000 000

Based on above two tables answer for following questions using SQL statements

(i). Insert a new employee called Kamal working as a Network Engineer in department of IT . (03 marks)

INSERT INTO Employee VALUES ('E004', 'Kamal', 'Network Engineer', 2)

(ii). Display the employee number, name, job and department name of the employee. (05 marks)

SELECT e.eno, e.ename, e.job, d.dname from employee e, department d where e.dno=d.dno

Select e.eno, e.ename,   e.job, d.dname   //1 mark
employee e, department d   // 2 mark
where e.dno=d.dno   // 2 mark

(iii). Display the department name and the number of employees in each department. (04 marks)

SELECT d.dname, count(e.eno) as Noofemployees from employee e, department d
where e.dno=d.dno
group by d.dno;

(iv). List the department for which budget exceeds Rs 200 000/=. Display the department number, name and budget. (04 marks)

Select * from from department where budget > 200000

(v). Change the HR department budget into 8000000 (04 marks)

UPDATE department SET budget=8000000
WHERE dno=1

Q5. (Total 20 marks)

(i). What is SQL3? (02 marks)

SQL3 is a superset of SQL/92, in that it supports all of the constructs supported by that standard, as well as adding new ones of its own.

An ORDBMS supports an extended form of SQL called SQL3 that is still in the development stages. The extensions are needed because ORDBMSs have to support ADT's.

(ii). Define what is meant by the term 'database transaction', (02 marks)

A *transaction* is a *unit* of program execution that accesses and possibly updates various data items.

(iii). List four features of Object Oriented Database Systems. (04 marks)

Complex objects

Object Identity

Encapsulation

Classes

Inheritance

Overriding and late-binding

Extensibility

Computational completeness

Persistence

Concurrency

Recovery

Ad-hoc querying

(iv). Explain GRANT and REVOKE statements in SQL with suitable examples.(04 marks)

GRANT – set permission   // 1 mark

REVOKE – block permission // 1 mark

One example for each 1*1 = 2 mark

Ex: Grant select on table personnel to John, Sylvia
Ex: Grant Select, Update(Hwage) on table personnel to Harry
Ex: Revoke Select on table personnel from John
Ex: Grant select on table personnel to Sylvia with grant option.
Ex: Revoke select on table personnel form syliva

(v). Briefly explain ACID property in a transaction.   (2*4=08 marks)

Atomicity - Either all operations of the transaction are properly reflected in the database or none are.

Consistency - Execution of a transaction in isolation preserves the consistency of the database.

Isolation - Although multiple transactions may execute concurrently, each transaction must be unaware of other concurrently executing transactions. That is, for every pair of transactions T_i and T_j, it appears to T_i that either T_j, finished execution before T_i started, or T_j started execution after T_i finished.

Durability - After a transaction completes successfully, the changes it has made to the database persist, even if there are system failures.

Q6.   **(Total 20 marks)**
  (i).   List any six (06) advantages of XML.   (03 marks)

(ii). What are the differences in XML compared to HTML?   (03 marks)

(iii). Define what well-formed XML document is.   (04 marks)

(iv). The following table containing segment of relation, named **clients** from an enterprise database. Represent them into XML tree and a XML document.

clients

name	email
Tharsan	tharsan20@gmail.com
Sunimal	rksunimal@yahoo.com
Sabras	mrsabras@yahoo.com

(06 marks)
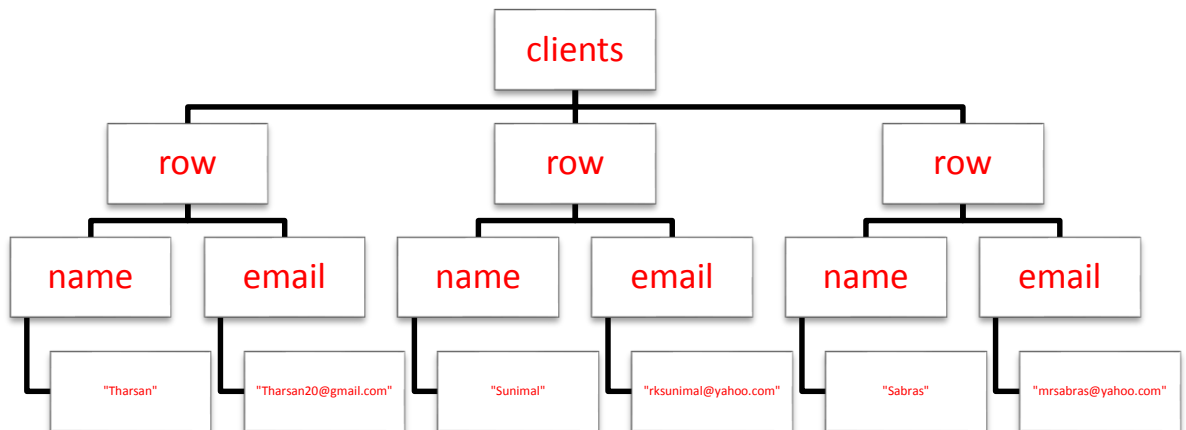
```
<?xml version="1.0" encoding="UTF-8"?>

<clients>

        <row> <name> Tharsan </name >
            <email> tharsan20@gmail.com </email ></row>
        <row> < name > Sunimal </name >
            < email > rksunimal@yahoo.com </email >
        <row> < name > Sabras </name >
            < email > mrsabras@yahoo.com </email ></row>
</ clients >
```

(v). Write the DTD for above XML document.

(04 marks)

```
<!DOCTYPE clients(row*) [
<!ELEMENT row  (name, email) >
<!ELEMENT name (#PCDATA) >
<!ELEMENT email(#PCDATA)  >
]>
```