Higher National Diploma in Information Technology

Second Year, First Semester Examination – 2017

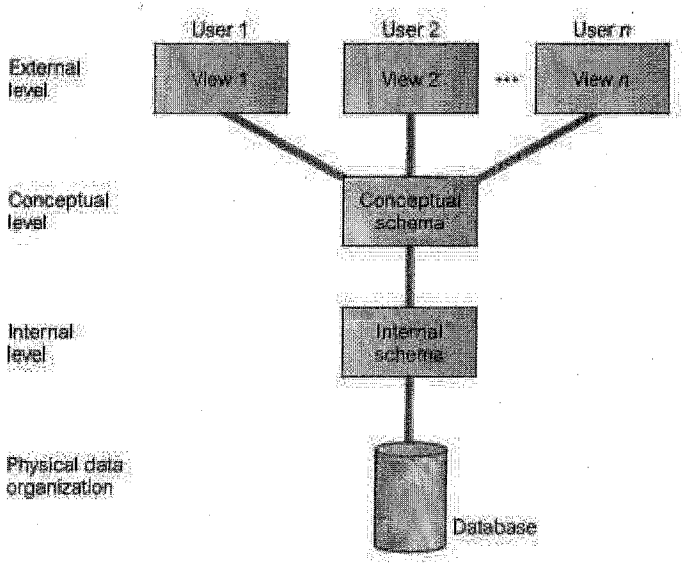
(HNDIT 2321) / **IT3201: Advanced Database Management System**

Marking Schemes

Question 1

I. The three-tier architecture is commonly used to implement a database driven web application.

a. Draw a diagram to illustrate this architecture. (4 marks)



b. Describe the role of each tier. (3 marks)

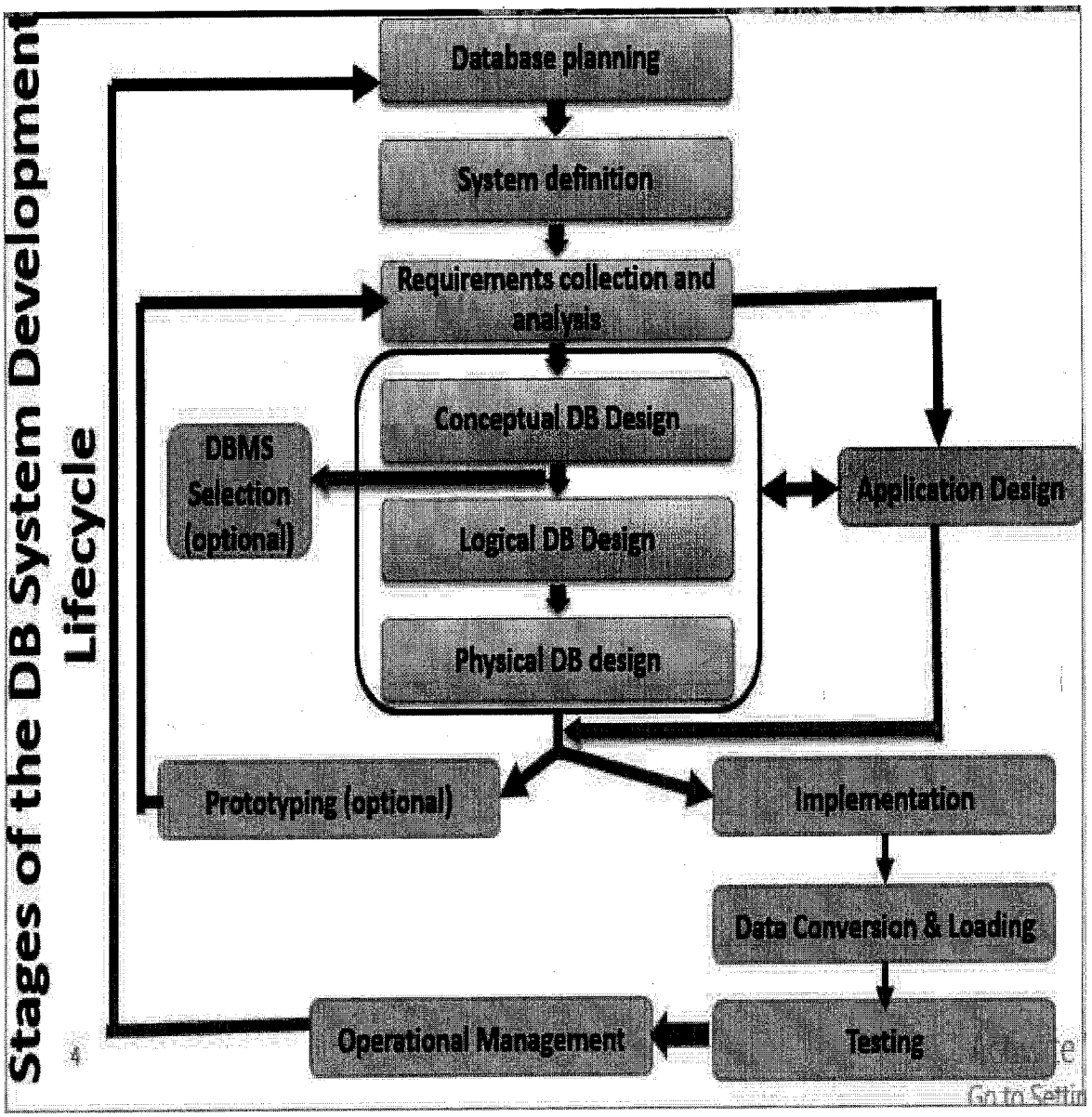
External level: The users' view of the database. This level describes that part of the database that is relevant to each user.

Conceptual level: The community view of the database. This level describes what data is stored in the database and the relationships among the data.

Internal level: The physical representation of the database on the computer. This level describes how the data is stored in the database.

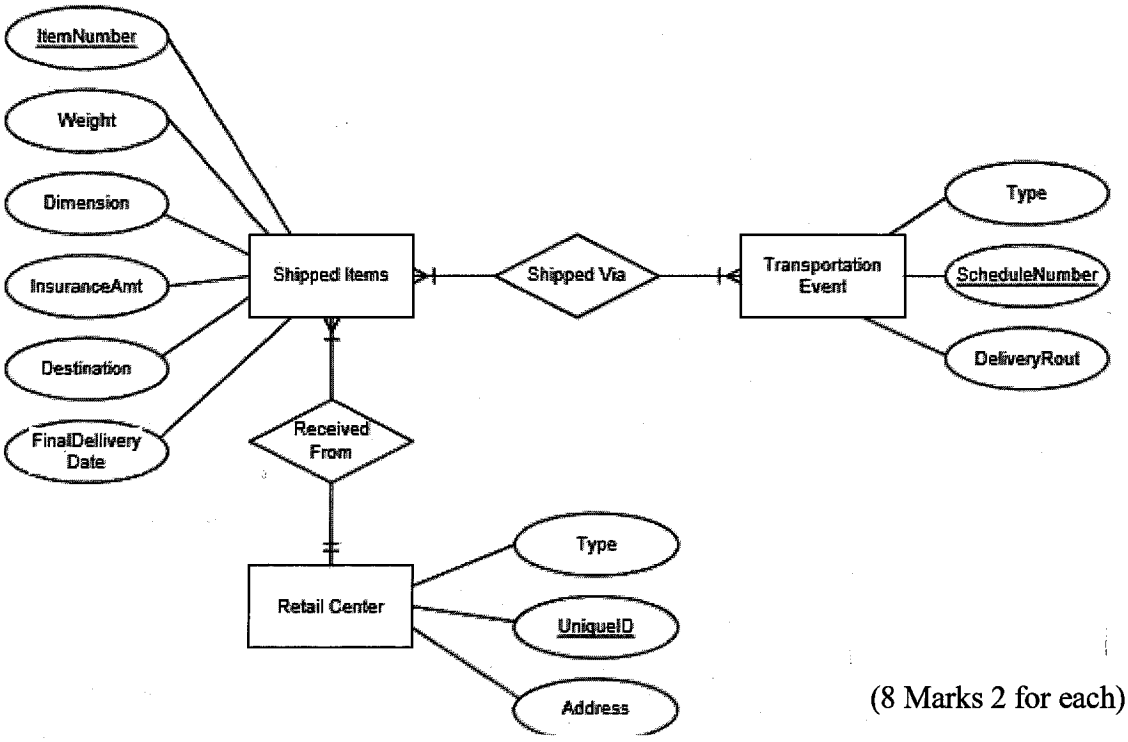
II. Database development life cycle contains following eleven main stages.

Name A to M in the above Diagram from the given list. (13 Marks)

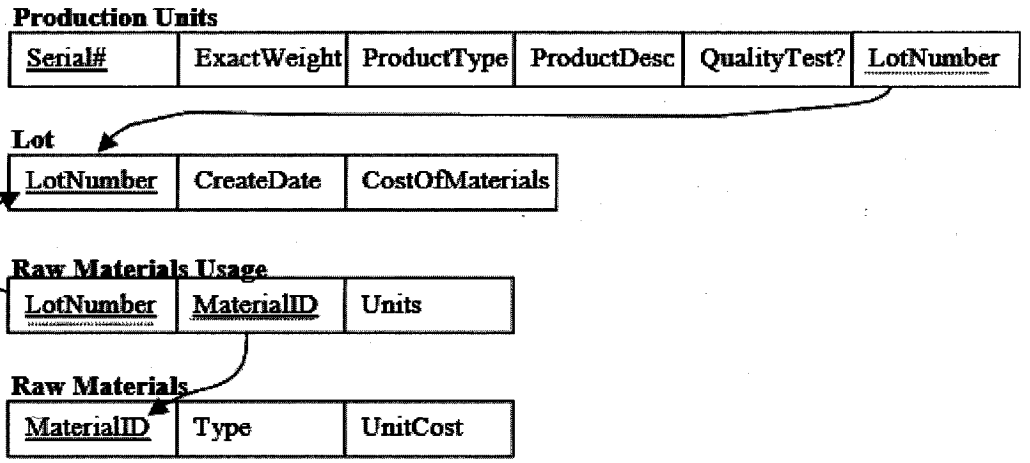

Stages of the DB System Development Lifecycle
Database planning
System definition
Requirements collection and analysis
Conceptual DB Design
DBMS Selection (optional)
Logical DB Design
Application Design
Physical DB design
Prototyping (optional)
Implementation
Data Conversion & Loading
Testing
Operational Management

Question 2

I. (12 Marks)



II. (8 Marks 2 for each)



Question 3

I. (8 Marks)

SELECT – select records from a table

INSERT – insert new records

UPDATE – update/Modify existing records

DELETE – delete existing records

II.

i)
```
SELECT p.pname FROM Parts AS p
    WHERE EXISTS (
    SELECT * FROM Catalog AS c
    WHERE c.pid = p.pid)
```

ii)
```
SELECT DISTINCT P.pname
        FROM Parts P, Catalog C
        WHERE P.pid = C.pid;
```

iii)
```
SELECT DISTINCT c1.sid AS SID
     FROM Parts AS p1, Catalog AS c1
     WHERE p1.pid = c1.pid AND p1.color = 'green')
     INTERSECT (
     SELECT DISTINCT c2.sid AS SID
     FROM Parts AS p2, Catalog AS c2
     WHERE p2.pid = c2.pid AND p2.color = 'red')
   Or
     SELECT DISTINCT c.sid
     FROM Catalog c, Parts p
     WHERE c.pid = p.pid and p.color = 'red'
     INTERSECT
     SELECT DISTINCT c.sid
     FROM Catalog c, Parts p
     WHERE c.pid = p.pid and p.color = 'green'
```

iv)
```
SELECT s.sid, s.sname
     FROM Suppliers AS s, Catalog AS c, Parts AS p
     WHERE s.sid = c.sid
     AND p.pid = c.pid AND p.color = 'red'
     GROUP BY s.sid, s.sname
     HAVING COUNT(*) = (SELECT COUNT(*) FROM Parts AS p1
     WHERE p1.color='red')
```
(12 Marks)

Question 4

I.

i) (3 marks)

The table violates 2nd Normal Form (1 mark) because there are two partial dependencies:

StudentID → StudentName (1 mark) and ModuleID → ModuleName (1 mark)

ii) Normalize the table up to the normal form identified in question i). (5 marks)

Student(StudentID, StudentName) (1.5)

Module(ModuleID, ModuleName) (1.5)

Results(StudentID*, ModuleID*, Grade) (2)

II. (12 marks)

Query 1

```
Mname      budget
---------  ------
Ashforce     NULL
Bass       675.00
Mission    250.00
Vallance   348.00

(4 row(s) affected)
```

Query 2

```
Totalbudget Mname
----------- ---------
       NULL Ashforce
    1350.00 Bass
     250.00 Mission
     348.00 Vallance
```

Query 3

```
EmployeeID  EmployeeID  membership
----------  ----------  ----------
E3          E5          Bass
```

Question 5

(i) A ***transaction*** is a *unit* of program execution that accesses and possibly updates various data items. (2 marks)

(ii) To ensure integrity of data, the database system must maintain:

Atomicity - Either all operations of the transaction are properly reflected in the database.

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.

Durability - After a transaction completes successfully, the changes it has made to the database persist, even if there are system failures. (8 marks)

(iii)

Active, the initial state; the transaction stays in this state while it is executing

Partially committed, after the final statement has been executed.

Failed, after the discovery that normal execution can no longer proceed.

Aborted, after the transaction has been rolled back and the database restored to its state prior to the start of the transaction. Restart the transaction – only if no internal logical error or kill the transaction

Committed, after *successful completion.* (10 marks)

Question 6

I.

The DOM defines a standard for accessing and manipulating documents:

"Document Object Model (DOM) is a platform and language-neutral interface that allows programs and scripts to dynamically access and update the content, structure, and style of a document."

The XML DOM defines a standard way for accessing and manipulating XML documents. It presents an XML document as a tree-structure.

(2 marks)

II. An XML document cannot be valid until it is well-formed. Well-formed XML is syntactically correct (it can be parsed), while valid XML is semantically correct (it can be matched to a known vocabulary and grammar (4 marks)

III. DTD defines the structure of the content of an XML document, and hence allows storing data in a consistent format. The DTD is a set of rules that defines an element, element attribute, attribute values, and the relationship between elements in the document. When an XML document is processed, it is compared to its associated DTD to ensure it is structured correctly and all tags are used correctly. Two types: Internal DTD External DTD (4 marks)

IV. (10 marks)