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COMP302 – Assignment 1

Question 1

a)

- Represents an aspect of the real world – it must be useful in the real life and therefore has to have all the attributes and functionality of the actual object, eg. book title in a library
- Well structured – must have a very strict for all the attributes of each object to stop the database becoming inconsistent.
- Reflects current state of the real world – in order to be useful it must be kept up-to-date both with information and functionality.
- Has users and applications – there is no point having a database if nobody uses it or there are no programs that use its information.
- Stored in a permanent computer memory – must be able to search or have records added/deleted, and information must not deteriate when not using it.

b)

- Defining – describes the structure in which the records are stored by means of Data Management System.
- Constructing – Must be able to make an empty database, and insert data into it
- Manipulation & Querying – Must be able to change the content of the record according changes to the UoD. We must be able to answer requests
- Preserving consistency – Keeping the database up-to-date by only allowing data that does not violate the database constraints.
- Protecting form misuse – Only allow the Database Administrator to change/add/remove records. Users can only view selected data.
- Recovering from failure – Not allow hardware faults or human error to corrupt database.
- Concurrent using – Allows more than one user to view that data but can only be changed by one person at a time (Database Administrator)

c)

A Data Dictionary is a A catalog in a database of all data elements, containing their names, structures, and information about their usage. It also stores applications and users and their privileges.

d)

Structural Component – Statements about database structure and constraints

Dynamic Component – Has both basic operations (database retrieval and update) and user-defined operations (allows database administrator to add special functionality), contained in Data Manipulation Language and a programming language.

e)

Navigational DML is procedural (has loops and branches etc) whereas Declarative

DML does not.

Navigational DML selects one record at a time, whereas Declarative DML selects all data that match conditions.

The search on the Navigational DML utilizes the physical organisation whereas the programs are independent of the physical organisation for the Declarative DML.

For the Navigational DML, programmer defines WHAT and HOW, whereas just WHAT for Declarative DML.

f)
A schema is a model of a real system and an abstract description of a database

A database schema information about database structure and constriants.

h)
Logical data independence is the ability to change the conceptual schema without having to change external schemas or application programs. Only the view definition and the mappings need to be changed in a DBMS. Changes to constraints can be applied to conceptual schema without affecting external schema's or application programs.

Physical data independence is the ability to change the internal schema without having to change the external (or conceptual) schema's. If data unchanged, no change in conceptual schema.

Question 2
a)
R_1 = {A, B, C}
$P(R_1)$ = {A, B, C, AB, BC, AC, ABC}
KeyConstraint(R_1) = {A, C}

R_2 = {D, E, F}
$P(R_2)$ = {D, E, F, DE, EF, DF, DEF}
KeyConstraint(R_2) = {E, F}

R_3 = {G, H, I}
$P(R_3)$ = {G, H, I, GH, HI, GI, GHI}
KeyConstraint(R_3) = {G, I}

R_4 = {C, E, J}
$P(R_4)$ = {C, E, J, CE, EJ, CJ, CEJ}
KeyConstraint(R_4) = {CE, CJ}

R_5 = {C, E, G}
$P(R_1)$ = {C, E, G, CE, EG, CG, CEG}

KeyConstraint(R_5) = {CEG}

R_6 = {I, L}
P(R_6) = {I, L, IL}
KeyConstraint(R_6) = {I, L}

b)
KeyConstraint(R_1) = {A, C}

KeyConstraint(R_2) = {E}

KeyConstraint(R_3) = {G}

KeyConstraint(R_4) = {CE, CJ}

KeyConstraint(R_5) = {CEG}

KeyConstraint(R_6) = {I}

Question 4

a)
20

b)
20*(2^31)*100 = 8.6*10^15

Question 5

a)
i. N
ii. Y
iii. N
iv. N

b)
i. N
ii. N
iii. Y
iv. N

c)
Only tuple (A(44), B(14), C(4)) can be deleted from relation r(N_1)

d)
All the tuples can be deleted from relation r(N_1)