

Question 1:

Part a)

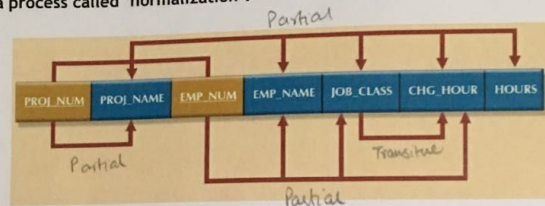
Dependency Diagram

Part b)

Show partial and transitive dependency. Removal of partial dependency is done in 2NF and removal of transitive dependency is done in 3NF.

- 1 : Showing Partial and Transitive dependency
- 1 : Explaining the normalization process
- 1 : Explaining that reducing to 2NF involves eliminating partial dependencies and reducing to 3NF involves transitive dependency.

Q1 (1+3=4 points). A 1NF table, such as the one shown below (we covered this in class on great detail), is analyzed to detect problems (related to unwanted dependencies), which are then systematically eliminated using a diagram such as the shown below (the table is converted to 2NF, then 3NF), in a process called 'normalization'.



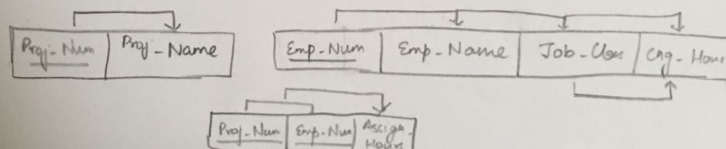
a. What is the diagram (shown above) called?

Dependency Diagram

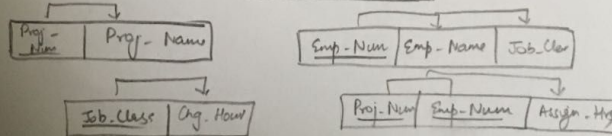
b. How does the diagram aid in normalization? Explain briefly, using the above diagram (you can mark it up if you want).

The diagram explains the transitive dependency & partial dependency. Partial Dependency can be used to bring down the table to 2NF & removal of transitive dependency yields in 3NF.

2NF



3NF



Question 2: Points are given as follows:

- 1 : For defining the steps in transaction T1
- 1 : For defining the steps in transaction T2
- 2 : For explaining the deadlock situation

Solution: as below from lecture slides

An important and unfortunate property of 2PL schedulers is that they are subject to *deadlocks*. For example, suppose a 2PL scheduler is processing transactions T_1 and T_3

$T_1: r_1[x] \rightarrow w_1[y] \rightarrow c_1$ $T_3: w_3[y] \rightarrow w_3[x] \rightarrow c_3$

and consider the following sequence of events:

1. Initially, neither transaction holds any locks.
2. The scheduler receives $r_1[x]$ from the TM. It sets $rl_1[x]$ and submits $r_1[x]$ to the DM.
3. The scheduler receives $w_3[y]$ from the TM. It sets $wl_3[y]$ and submits $w_3[y]$ to the DM.
4. The scheduler receives $w_3[x]$ from the TM. The scheduler does not set $wl_3[x]$ because it conflicts with $rl_1[x]$ which is already set. Thus $w_3[x]$ is **delayed**.
5. The scheduler receives $w_1[y]$ from the TM. As in (4), $w_1[y]$ must be **delayed**.

Question 3:

Points are given as follows :

The breakthrough was Relational Database and the operations associated with them.

- 4 marks - If mentioned about the relational database and explained properly.
- 3 marks - If explanation is not satisfactory
- 2 marks if only mentioned about set operations and not relational database/no explanation
- No marks if the student has written about Performance Tuning, SQL, Distributed Databases, File Systems, Use of Databases or any other irrelevant matter,

Question 4:

Part a)

The correct order is Partition Tolerance, Availability, Consistency (P,A,C). However, the order (A,P,C) is also accepted.

Points are given as follows:

- 0.5 : For correct order.
 - 0.5 : For correct acronym expansion.
 - 1 : For correct reasons. 0.5 each for justification of the most and the least important concern.
- NOTE: If your least or the most important concern is incorrect, then no points will be given for justification. For example, if your ordering is A,C,P, then 0.5 will be deducted, as the justification of the least important concern is incorrect. Similarly, if you have used incorrect acronym, for example, A for Accuracy, then your justification for A will be incorrect.

Part b)

Solution: Nodes can be located on other planets, satellites or different places on earth. Disaster scenario may meteoroid strike, problems in satellite etc.

Answer should include correct location information along with two disaster scenarios.

Points are given as follows:

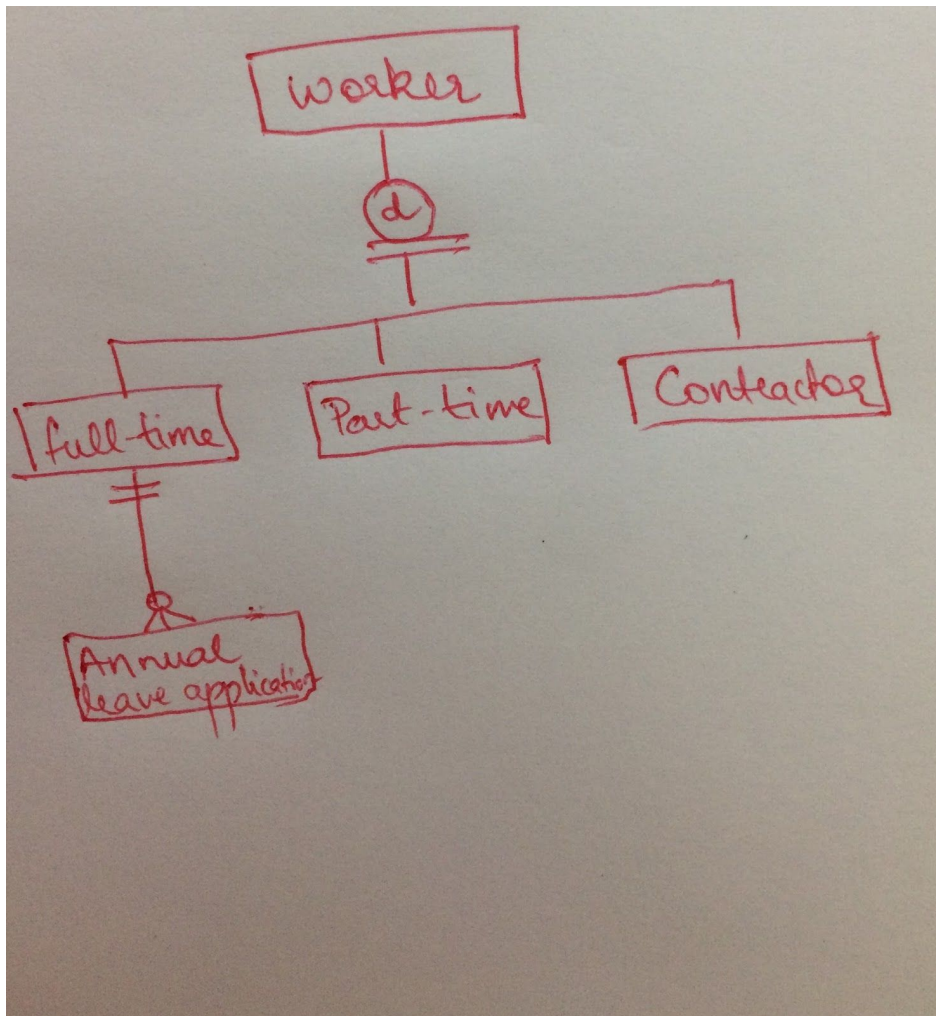
- 1 : Correct location information.
- 0.5 each for the disaster scenario . At least two disaster scenarios are required.

Question 5

Common mistakes for Q-5,

- Contractor is not shown as a separate sub-class
- Disjoint hierarchy is not used
- Annual leave application should be associated with only the full-time sub-class, not the worker super-class
- Diagram is required, only the explanation is not given grade

Solution for question 5,



Question 6:

This is the rubric i followed while awarding points for the question 6

1.5 points for correct explanation

0.5 points for final query result

Answer:

1) Expected Explanation: (1.5 points)

The query returns workorder_id of those projects whose '0'th step has a 'completed' or 'C' status and all other steps are in "awaiting" or 'A' status.

2) Query Result: Workorder_id: (0.5 points)

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Common Mistake:

Most students have given the correct explanation but have not provided the final result and hence lost -0.5 points for the same.

If the explanation is correct but the final answer is incorrect, then i have deducted 1 point.

Some students said the query will return Null as they have not understood that the query is correlated or made a mistake interpreting the inner subquery.

Question 7:

The common mistakes done by students were:

- They could only identify two of the queries to be similar.
- Another mistake was to mark Two choices as correct and specially the case was when marking all the three identical as well as just 2 queries identical to be the answer. In that case I had to give them 0.

Question 8 (BONUS)

ONLY ONE ANSWER (Kindly do not argue over your solution. Following is the only solution to this problem.)

