Feedback of Coursework 5 - G51DBS
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1 Question 1

Most answers have correctly stated that $\{Film\} \rightarrow Certificate$ is a non-trivial FD. However, as the question is to list *all* non-trivial FDs, the correct answer should be:

$\{Film\} \cup X \rightarrow Certificate$ where $X \subseteq \{Cinema, Day, Time\}$

Only a few get full mark from this question. Some answers got full mark as they list all 8 non-trivial FDs. Also, there are some minor errors with using symbols for the functional dependency. Note that the left hand side (LHS) of the arrow is always a set of attributes (that's why we use the union $\cup$ symbol to join two sets $\{Film\}$ and X), and the RHS is an attribute. A functional dependency is called *non-trivia*l if the LHS set does not contain the RHS attribute.

2 Question 2

Most submissions correctly identify the only candidate key, which is $\{Cinema, Day, Time, Film\}$. However, some common mistakes are that some confuse that each of the attributes is a key while others cannot distinguish a candidate key (i.e., a set of attributes) from a functional dependency (with an arrow e.g., $\{Film\} \rightarrow Certificate$).

About half of the attempts didn't answer or answered incorrectly the second part of the question (i.e., explain why the candidate key is minimal and unique). Note that one could not say that it is minimal because it is not necessary to add $Certificate$ into the set. To claim that a set is minimal, one needs to prove that the set is no longer valid if someone tries to remove an element from that set (i.e., there is no proper subset of that set satisfying the requirement). For example, we might say that if $\{Cinema\}$ is removed from the candidate key, it is not unique anymore as the same film can be shown at the same time on the same day, but in different cinemas.

3 Question 3

Almost all submissions are correctly stated that the relation is not in 2NF. But many of the explanation are incorrect. Note that *the relation is in 1NF*, but it is still not in 2NF because there is a non-trivial FD where the determinant (the LHS of the arrow) is

a part of the candidate key (e.g., $\{Film\}$ is only a part of $\{Cinema, Day, Time, Film\}$) and the dependant (the RHS of the arrow) is a non-key attribute ($Certificate$ is not an element of the candiate key).

4 Question 4

Only a few attempts didn't give a correct example of update anomaly. Some did state the definition of update, insert and even delete anomalies, but did not give any example while the others did give examples of insert and delete anomalies, but not update anomalies. These answers, unfortunately, get no mark for this question. Therefore, it would never be unnecessary to read the question carefully before answering (especially in the exam).

We might think about update anomaly as there would be some logical inconsistencies if we update some records in the database. Therefore, it usually comes from *the duplication of data which is dependent on other data.* For example, remember that a film has only one certificate (due to the non-trivial FD mentioned above), so if we change the certificate to different values, we will have an inconsistent state in our database where a film has different certificates.

In consequence, changing a film title, a day, a time, or even a cinema will not lead to any inconsistency as they are not dependent on any other attribute.

5 Question 5

Although there are many attempts on this question, not all of them explain correctly why the resulting relations are in BCNF.

One common mistake is that some stated "They are in BCNF because all the dependencies are removed". This is incorrect because in the Showing table ($\{Cinema, Day, Time, Film\}$ there are still trivial dependencies) and in the Film table ($\{Film, Certificate\}$), there is still one non-trivial FD between Certificate and $\{Film\}$.

Another mistake is that in the decomposition, the two resulting relations are not linked to each other. For example, some decomposed the original relation into Showing ($\{Cinema, Day, Time\}$) and Film ($\{Film, Certificate\}$). Then what is the relationship between these resulting relations?

A note is that there are some attempts to "invent" new attributes such as $cinemaID$, $filmID$ to use as the primary keys of $Cinema$ table and $Film$ table. As a result, there are totally 3 tables: $Showing$, $Cinema$, and $Film$. These answers still get the full marks as long as they correcly explain why the relations are in BCNF.