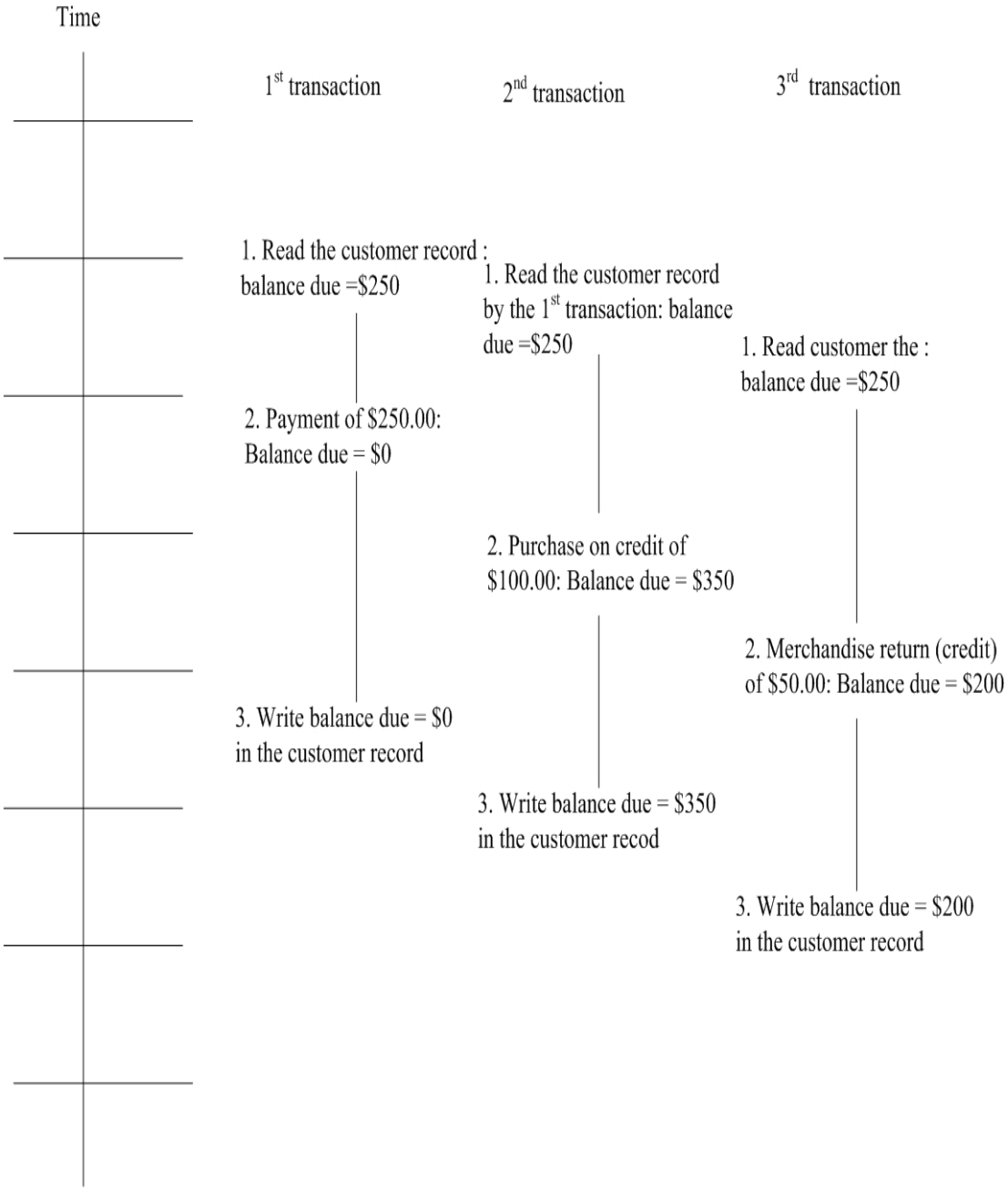
EE4791 Database Systems - Tutorial 12 and Sample Answer

1. Whitlock Department Stores runs a multiuser DBMS on a LAN file server. Unfortunately, at the present time, the DBMS does not enforce concurrency control. One Whitlock customer had a balance due of 250.00 when the following three transactions related to this customer were processed at about the same time:
    - Payment of $250.00
    - Purchase on credit of $100.00
    - Merchandise return (credit) of $50.00

    Each of the three transactions read the customer record when the balance was $250.00 (i.e., before any of the other transactions were completed). The updated customer record was returned to the database in the order shown in the bulleted list above.
    a. Show the sequence of events for the above-mentioned situation. What balance will be included for the customer after the last transaction was completed?
    b. If proper X locking mechanism is implemented, show the sequence of events for processing the transactions in the order shown in the bulleted list above. What balance should be included for the customer after the three transactions have been processed?
    c. If versioning is implemented for concurrency control, show the sequence of events for processing the transactions in the order shown in the bulleted list above. What balance should be included for the customer after the three transactions have been processed (without restarting any transaction)?

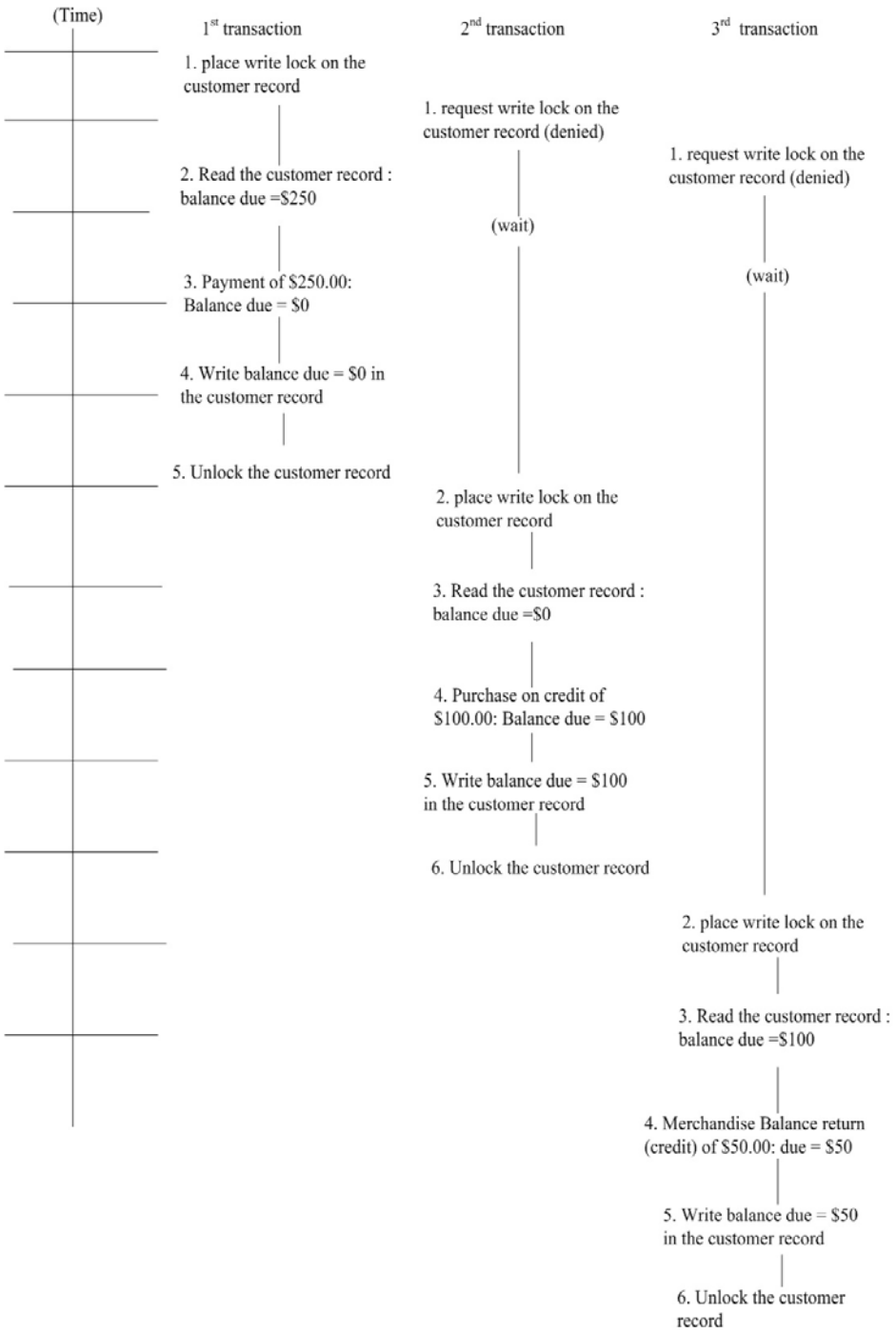
Answer

a.



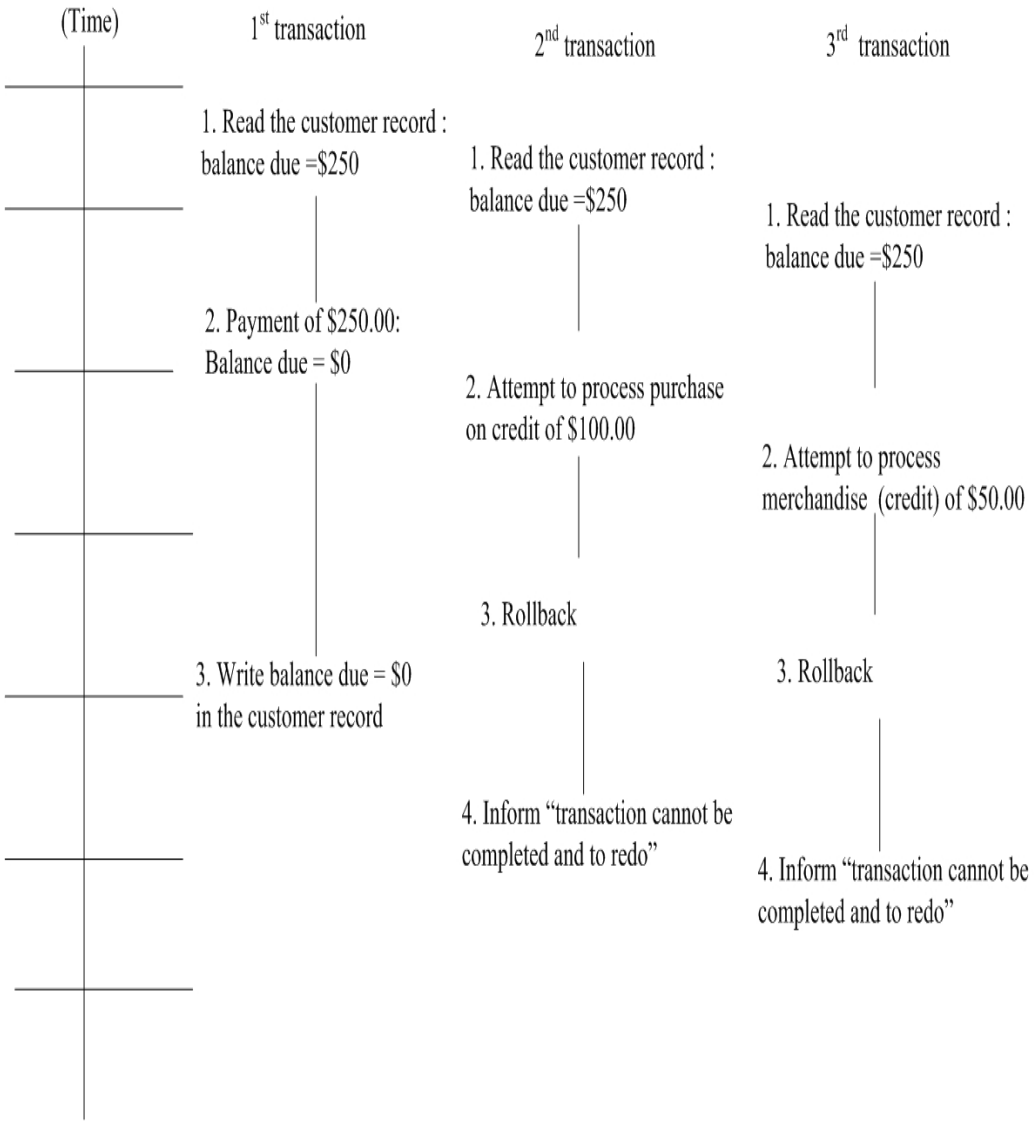
Hence, the included balance for the customer after the three transactions have been processed = $200.

b.



Hence, the included balance for the customer after the three transactions have been processed = $50.

c.



Hence, the included balance for the customer after the three transactions have been processed = $0.

2. For each situation described below, decide the appropriate recovery techniques to be applied:
    a. A phone disconnection occurs while a user is entering a transaction.
    b. A disk drive fails during regular operations.
    c. A lightning storm causes a power failure.
    d. An incorrect amount is entered and posted for a student tuition payment. The error is not discovered for several weeks.
    e. Data entry clerks have entered transactions for two hours after a full database backup when the database becomes corrupted. It is discovered that the journalizing facility of the database has not been activated since the backup was made.

Answer

Appropriate recovery techniques:

a. Aborted transaction: use backward recovery. Of course, the transaction then needs to be re-entered.
b. Database destruction: use forward recovery to recover from the backup copy of the database.
c. System failure: use forward recovery to recover all the completed transactions from the most recent checkpoint.
d. Incorrect data: enter a compensating transaction and notify the student of the error.
e. If the system are the database are mirrored, then switch to the mirrored system and database. If they are not mirrored, use the latest backup copy and reprocess all the transactions manually.

3. For each of the situations described below, indicate which security measure is most appropriate:
    a. A national brokerage firm uses an electronic funds transfer (EFT) system to transmit sensitive financial data between locations.
    b. An organization has set up an offsite computer-based training center. The organization wishes to restrict access to the site to authorized employees. Because each employee's use of the center is occasional, the center does not wish to provide the employees with keys to access the center.
    c. A manufacturing firm uses a simple password system to protect its database but finds it needs a more comprehensive system to grant different privileges (e.g., read, versus create or update) to different users.
    d. A university has experienced considerable difficulty with unauthorized users accessing files and databases by appropriating passwords from legitimate users.

Answer

Appropriate security measures:

a. Encryption
b. Authentication schemes
c. Authorization rules
d. Authentication schemes