

# **CHAPTER 2**

## **INTRODUCTION TO TRANSACTION PROCESSING**

### **REVIEW QUESTIONS**

1. The expenditure cycle, conversion cycle, and revenue cycle.
2. Purchases/accounts payable system, cash disbursements system, and payroll system.
3. The physical component includes the acquisition of goods, while the financial component includes the recognition of a liability owed to the supplier and the transfer of the payment to the supplier.
4. Production system and cost accounting system.
5. Sales order processing system and cash receipts system.
6. Source documents, product documents, and turnaround documents.
7. Special journals and the general journal.
8. A general journal is used to record nonrecurring and infrequent transactions. Oftentimes, general journals are replaced with a journal voucher system. The journal voucher is used to record a single nonrecurring and infrequent transaction, and it is used as a special source document for the transaction. The total of journal vouchers processed is equivalent to the general journal.
9. General ledger and subsidiary ledger.
10. A trail that allows the auditor to begin with a summary total found on the financial statements and track it back to the individual transactions that make up this total. Conversely, an auditor should be able to track transactions to their final impact on the financial statements.
11. The confirmation process entails selecting customers and contacting them to determine whether the transactions recorded in the financial statements actually took place and are valid.
12. Master files, transaction files, reference files, and archive files.
13. Master files correspond to general ledger accounts and subsidiary ledgers. Examples include accounts receivable and customer subsidiary accounts, accounts payable and vendor subsidiary accounts, inventory, etc. Transaction files correspond to general and special journals. Examples include the general journal, sales journals, cash receipts journals, payroll journals, etc. Reference files include lists of vendors, delinquent customers, tax tables, sales tax rates, discount rates, lists of customers granted specific discounts, etc. Archive files are typically composed of records that have been processed but are retained for their history. Examples include payroll transactions, sales transactions, etc.

14. The digital audit trail, like the paper trail, allows us to trace transactions from the financial statement balance back to the actual transaction so we may: (1) compare balances, (2) perform reconciliations, (3) select and trace samples of entries, and (4) identify, pull, and verify specific transactions.
15. Cardinality reflects normal business rules as well as organizational policy. For instance, the 1:1 cardinality in the first example in Figure 2-12 suggests that each salesperson in the organization is assigned one automobile. If instead the organization's policy were to assign a single automobile to one or more salespeople that share it, this policy would be reflected by a 1:M relationship.
16. Entity relationship diagrams represent the relationship between entities (resources, events, and agents) in a system. Dataflow diagrams represent the logical elements (i.e. what is being done) of a system by illustrating processes, data sources, data flows, and entities. System flowcharts represent the physical elements being used (i.e., how the tasks are being conducted) by illustrating the relationship between input sources, program, and output products. Document flowcharts represent both the logical and physical elements of manual systems. Document flowcharts also illustrate the preparation and handling of documents.
17. Cardinality refers to the numerical mapping between entity instances, and it is a matter of organization policy. The relationship can be one-to-one, one-to-many, or many-to-many.
18. An **entity relationship (ER) diagram** is a documentation technique used to represent the relationship between entities. One common use for ER diagrams is to model an organization's database, which we examine in detail in Chapter 9.
19. Entities are physical resources (automobiles, cash, or inventory), events (ordering inventory, receiving cash, shipping goods), and agents (salesperson, customer, or vendor) about which the organization wishes to capture data.
20. Batch processing occurs when similar transactions are accumulated over time and processed together. Real-time processing captures each event or transaction and processes it before engaging in another transaction. If transactions are independent of one another, such as the processing of daily cash receipts, then batch processing is appropriate. If transactions are dependent on one another, such as credit sales, ticket sales, etc., then real-time processing is more appropriate.
21. During the file update process, sequential master files are completely reproduced in the form of a physically new file, thus creating a backup copy automatically. Databases use destructive update procedures and require separate backup procedures.
22. No. A DFD shows which tasks are being performed, but not who performs them. It depicts the logical system.
23. A flowchart depicts the physical system and illustrates what type of and where a task is performed and who is performing it.
24. A single transaction may affect several different accounts. Some of these accounts, however, may not need to be updated in real time. In fact, the task of doing so takes

time which, when multiplied by hundreds or thousands of transactions, can cause significant processing delays. Batch processing of non-critical accounts, however, improves operational efficiency by eliminating unnecessary activities at critical points in the process.

25. When testing an application program, the auditor needs details about its internal logic provided by the program flowchart to design the audit tests.
26. The system flowchart shows the relationship between two computer programs, the files that they use, and the outputs that they produce. However, this level of documentation does not provide the operational details that are sometimes needed. An auditor wishing to assess the correctness of a program's logic cannot do so from the system flowchart. A program flowchart provides this detail. Every program represented in a system flowchart should have a supporting program flowchart that describes its logic.
27. Legacy systems tend to have the following distinguishing features: they are mainframe-based applications, they tend to be batch-oriented, and early legacy systems use flat files for data storage. However, hierarchical and network databases are often associated with later-era legacy systems. These highly structured and inflexible storage systems promote a single-user environment that discourages information integration within business organizations.
28. Batch processing and real-time processing.
29. Prior to each batch update or periodically (every few minutes), the master file being updated is copied to create a backup version of the original file. Should the current master be destroyed after the update process, reconstruction is possible in two stages. First, a special recovery program uses the backup file to create a pre-update version of the master file. Second, the file update process is repeated using the previous batch of transactions to restore the master to its current condition.
30. Record layout diagrams are used to reveal the internal structure of the records that constitute a file or database table. The layout diagram usually shows the name, data type, and length of each attribute (or field) in the record.
31. Updating a master file record involves changing the value of one or more of its variable fields to reflect the effects of a transaction.
32. A flat-file structure is a single-view model that characterizes legacy systems in which data files are structured, formatted, and arranged to suit the specific needs of the *owner* or primary user of the system. Such structuring, however, may omit or corrupt data attributes that are essential to other users, thus preventing successful integration of systems across the organization.
33. Destructive update involves replacing an old data value with a new value and thus destroying the original.
34. Transaction volume is the key factor. Large-scale systems that process high volumes of transactions often use real-time data collection and batch updating. Master file records that are unique to a transaction such as customer accounts and individual inventory records can be updated in real time without causing operational delays. Common accounts should be updated in batch mode. Real-time processing

is better suited to systems that process lower transaction volumes and those that do not share common records.

35. In a real-time processing environment, the master files are updated as soon as the transaction is submitted and accepted into the system. Thus, reports are more accurate in the sense that the information is as current as possible. Faster operational response time to customer requests such as the shipping of an order is another, and very important, benefit. Finally, the reduction of paper and storage space of physical source documents is another benefit.
36. By collecting data in real time, certain transaction errors can be prevented or detected and corrected at their source.

## DISCUSSION QUESTIONS

1. Cash flows into the firm from sales made to customers. The sales order processing subsystem of the revenue cycle captures the intent of customers to exchange cash for services or goods manufactured. Typically sales are made on credit. The cash receipts subsystem of the revenue cycle captures the actual receipt of cash. Depending on the credit terms and promptness of payment by the customer, the lag between the sales order processing subsystem and the cash receipts subsystem may be days, weeks, or months.

The cash inflow allows the organization to purchase raw materials, pay workers, and buy capital assets necessary to manufacture the product (or to provide services). The raw materials requirements are determined by the production planning subsystem of the conversion cycle. These requirements trigger orders being placed through the purchases/accounts payable subsystem of the expenditure cycle. For credit sales, the cash is ultimately released once the goods are received (or services are performed) and an invoice has been received. The lag between receiving goods and disbursement of cash may be days or weeks. Cash is also disbursed to employees, typically after services are rendered by the employees. The lag is usually no more than one-half a month for salaried employees and as short as one-half a week for hourly wage earners. The payroll subsystem of the expenditure system captures these disbursements to employees.

2. Initially, the cost accounting system was used for the valuation of inventory and cost of goods sold reported to external users; however, the valuable use of cost accounting data for budgeting, cost control, performance reporting, and management decision making have proved to be crucial internal support.
3. The conversion cycle activities for service and retailing entities include planning the items to purchase or the services to produce, planning the workforce to accomplish the necessary tasks (extremely crucial in service entities), and directing the workforce in performing the service or selling the good.
4. Yes. For example, the remittance advice of a bill that is returned with the payment serves as a source document for the cash receipts transaction processing system. Thus, the product document becomes a source document.

5. This type of transaction is recorded in the general journal since it is nonrecurring, infrequent, and not similar to other types of transactions.
6. Sometimes the terms are used interchangeably, such as the sales journal is sometimes called the sales register. The term journal is appropriate when the information needs to be ultimately posted to the general ledger. Registers may be used to keep logs of information that may support, but do not specifically get posted to the general ledger, such as a raw materials receipts register or a shipping log.
7. The balance in the general ledger is considered a control account. This amount is an aggregated number representing the total amount owed to creditors listed in the accounts payable journal. The accounts payable subsidiary ledger details the exact amount owed to each creditor. The sum of the amounts owed to each creditor listed in the accounts payable journal should equal the corresponding control total in the general ledger. Thus, the accounts payable subsidiary ledger is a detailed breakdown of the summary control total of accounts payable in the general ledger.
8. Confirmation is most typically used for confirming the accounts receivable account as reported on the balance sheet. The audit trail is used to trace from the general ledger accounts receivable control account to the subsidiary account, and then to specific customer accounts. A sample of the customer accounts is then selected for confirmation.
9. In theory, the magnetic audit trail functions the same as a manual audit trail. In practice, the steps are slightly different. The archive file that consists solely of valid transactions is the file to which the accounts receivable subsidiary account balances and transactions are traced. The customers still need to be contacted for confirmation.
10. Small batches have the advantage of fewer transactions to sort through for error detection, but they are not processed as efficiently. Further, computing facilities and constraints might dictate whether multiple small batches may be processed throughout the day or whether a single large batch is processed at night when the computing facilities have excess capacity. (Multiple small batches may still be processed in the evening.)
11. Not all modern organizations use entirely modern information systems. Some firms employ legacy systems for certain aspects of their data processing. When legacy systems are used to process financially significant transactions, auditors need to know how to evaluate and test them.
12. Large-scale systems that process high volumes of transactions often use real-time data collection and batch updating. Master file records that are unique to a transaction, such as customer accounts and individual inventory records, can be updated in real time without causing operational delays. Common accounts should be updated in batch mode. Real-time processing is better suited to systems that process lower transaction volumes and those that do not share common records.
13. Real-time processing is better suited to systems that process lower transaction volumes and those that do not share common records.

14. A hashing structure typically works by taking a key value and using it to divide a prime number. The result is a unique number almost all of the time if enough decimal places are used. The resulting numbers are used to find the unique location of the record. Calculating a record's address is faster than searching for it through an index. It is not used exclusively because it does not use the storage disk efficiently. Some disk locations will never be selected because they do not correspond to legitimate key values. Also, different record keys may sometimes translate to the same address and data collision could occur. A way around this is using pointers, but the additional pointers slow down the system.
15. The **virtual storage access method (VSAM)** structure is used for very large files that require routine batch processing and a moderate degree of individual record processing. For instance, the customer file of a public utility company will be processed in batch mode for billing purposes and directly accessed in response to individual customer queries. Because of its sequential organization, the VSAM structure can be searched sequentially for efficient batch processing.
16. A **physical address pointer** contains the actual disk storage location (cylinder, surface, and record number) needed by the disk controller. This approach allows the system to access the record directly without obtaining further information.

A **relative address pointer** contains the relative position of a record in the file. This address (i.e., the 200th record on the file) must be further manipulated to convert it to the actual physical address. The conversion software determines this by using the physical address of the beginning of the file, the length of each record in the file, and the relative address of the record being sought.

A **logical key pointer** contains the primary key of the related record. This key value is then converted into the record's physical address by a hashing algorithm.
17. The auditor should examine the document flowchart since it clearly depicts the separation of functions and illustrates who is responsible for performing specific processing steps. The dataflow diagram illustrates the logical system and is too general since many different physical designs may be applicable. The system flowchart illustrates the flow between input, processing, and output elements and does not provide the operational information necessary to discern processing responsibility.

## MULTIPLE CHOICE

1. C
2. A
3. E
4. B
5. A
6. D

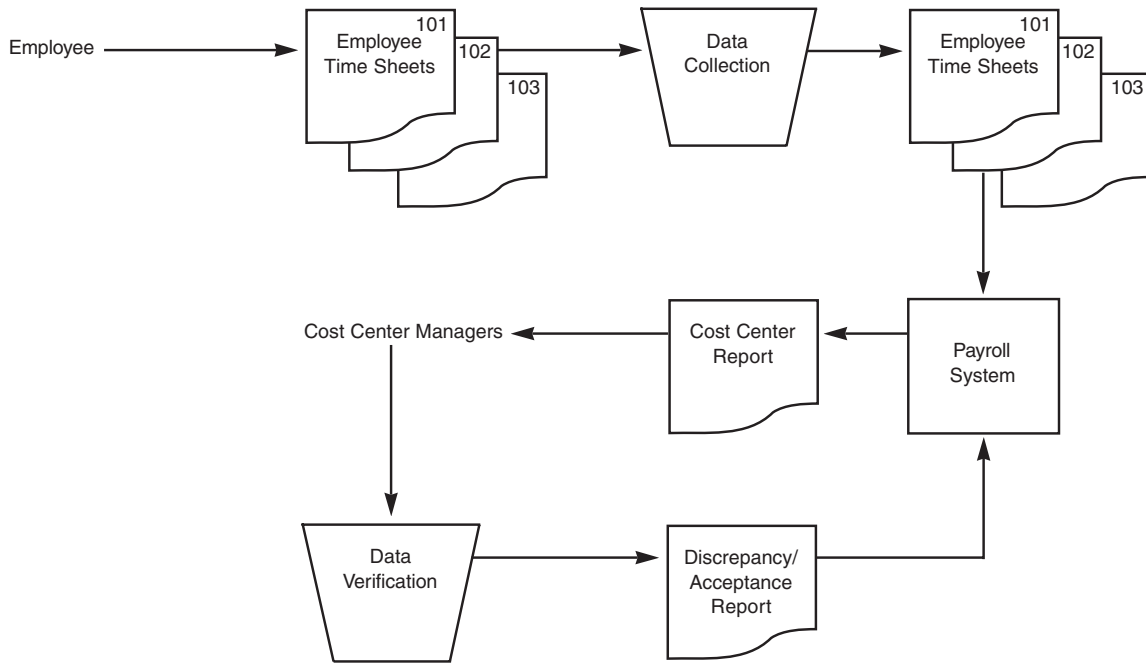
- 7. D
- 8. D
- 9. C
- 10. C
- 11. A
- 12. C
- 13. A
- 14. C
- 15. A
- 16. C
- 17. B
- 18. B

## **PROBLEMS**

- 1.
  - a. Expenditure cycle-payroll subsystem.
  - b. Conversion cycle-production system subsystem.
  - c. Revenue cycle-cash receipts subsystem..
  - d. Revenue cycle-sales order processing subsystem.
  - e. Expenditure cycle-purchases subsystem.
  - f. Conversion cycle-production subsystem.
- 2.
  - a. master file
  - b. transaction file
  - c. reference file
  - d. archive file
  - e. master file
  - f. transaction file
  - g. reference file
  - h. archive file

3.

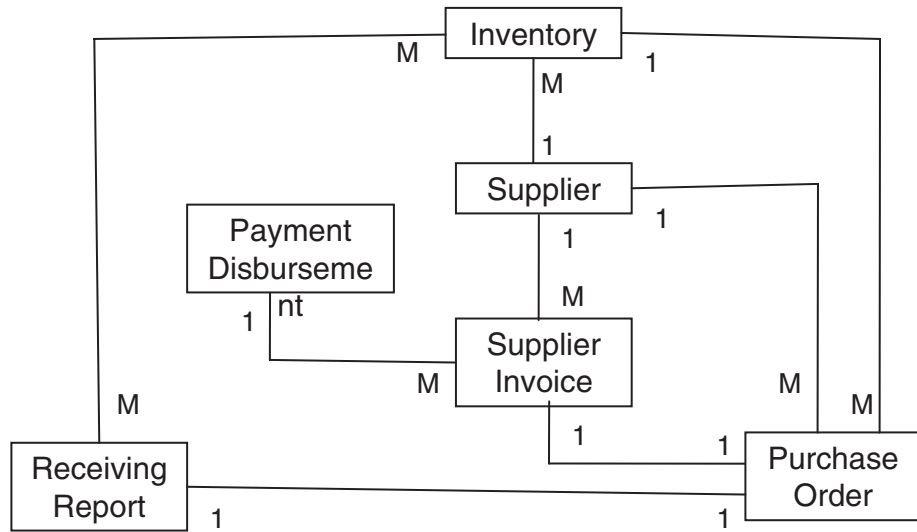
Solution to problem 2–3



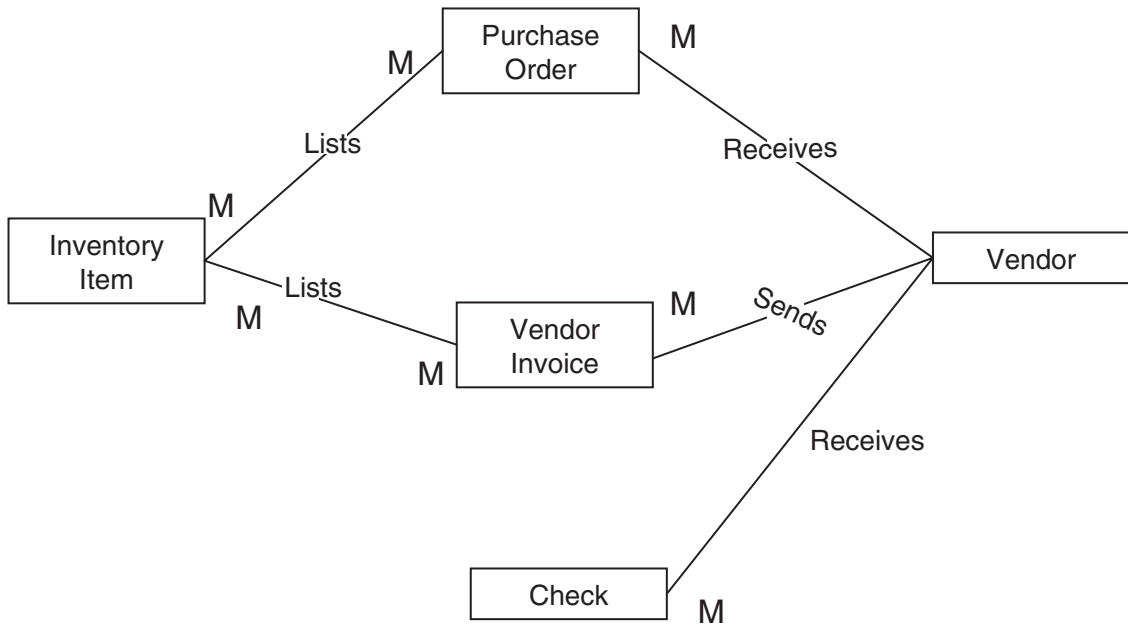
4. The receiving department is a department that prepares many purchase requisitions, which are sent to the purchasing department. The purchasing department prepares many purchase orders, which are sent to suppliers. The many different suppliers each may ship many different inventory items to the receiving department of the customer, although each purchase order will be for only one inventory item. The receiving clerk receives the many different inventory items and prepares a receiving report for each shipment that will relate to one purchase order.



5. The drawing for Problem 4 would be modified to add the supplier's invoice.



6.



**Business Rules:**

An inventory item may be ordered many times from many suppliers. A purchase order may list many items and a supplier may supply many items.

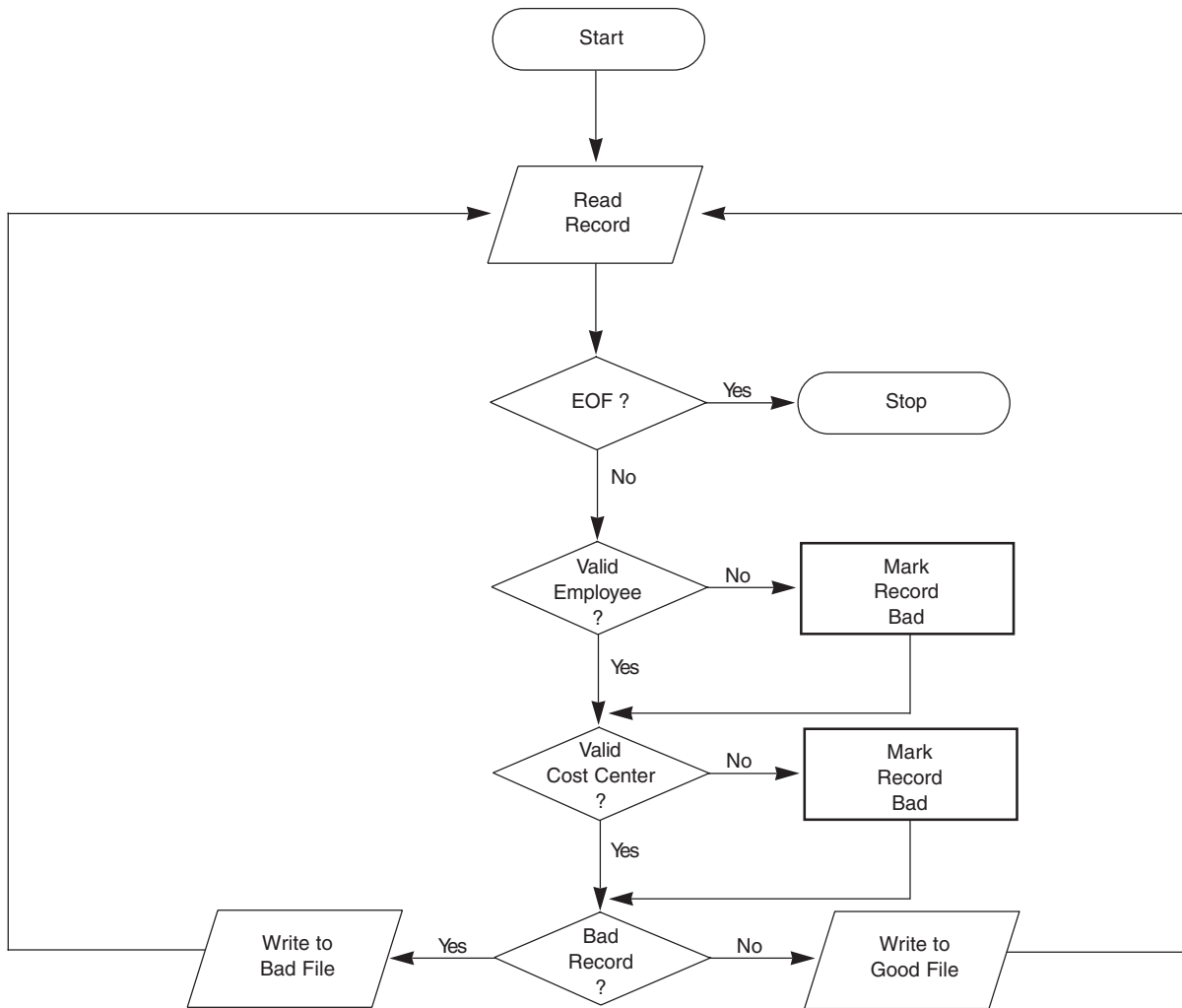
A purchase order may be sent to only one vendor. A vendor may receive more than one purchase order.

An invoice comes from only one vendor, but a vendor may send more than one invoice.

7.
  - a. Symbol 1 is a terminal showing the source or destination of a document or report; symbol 2 is source document or report.
  - b. Symbols 3 and 4 depict the entry of data in real time into a system from a computer terminal.
  - c. Symbols 4 and 5 depict the storage/retrieval of data to/from a computer disk.
  - d. Symbols 6, 8, and 9 depict the processing of a source document and its placement into a file.
  
8. Time sheets are collected in a batch, and the information is manually keyed into the system. This data is now stored on a magnetic disk. An editing program is run, which verifies whether the employee number is valid by checking it against an employee master file. The validity of the cost center assigned is also verified against a master file. Logical and clerical errors should also be tested, such as an employee working an unreasonable number of hours in a day/week. Records that are found to be in error are sent to an error file. These errors need to be investigated and corrected. The good records are stored in a data file. The next program takes the edited transaction records, one at a time, and updates any corresponding fields in the master files. Finally, a report program generates paychecks and management reports.
  
9. Any of the following types of errors may cause a payroll record to be placed in the error file:
  - a. invalid employee number
  - b. invalid cost center
  - c. incorrect batch/control total that does not equal the totals computed by the program

A program flowchart is presented below.

solution to problem 2-9



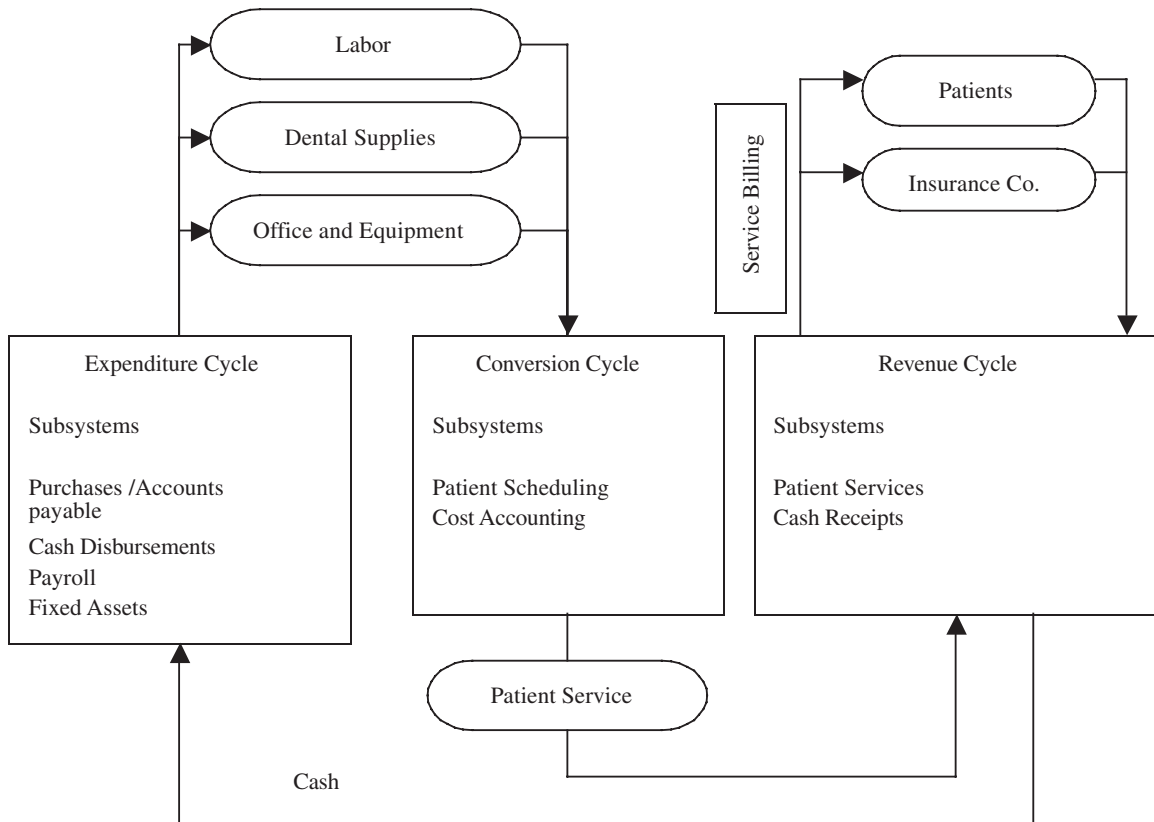
10. A rectangle is used to represent an entity. An entity might be the source of a document or activity, or the destination of a document.

A rectangle with rounded corners represents and a process.

A rectangle without the right most line represents a data store, or the place from which data for obtained or stored.

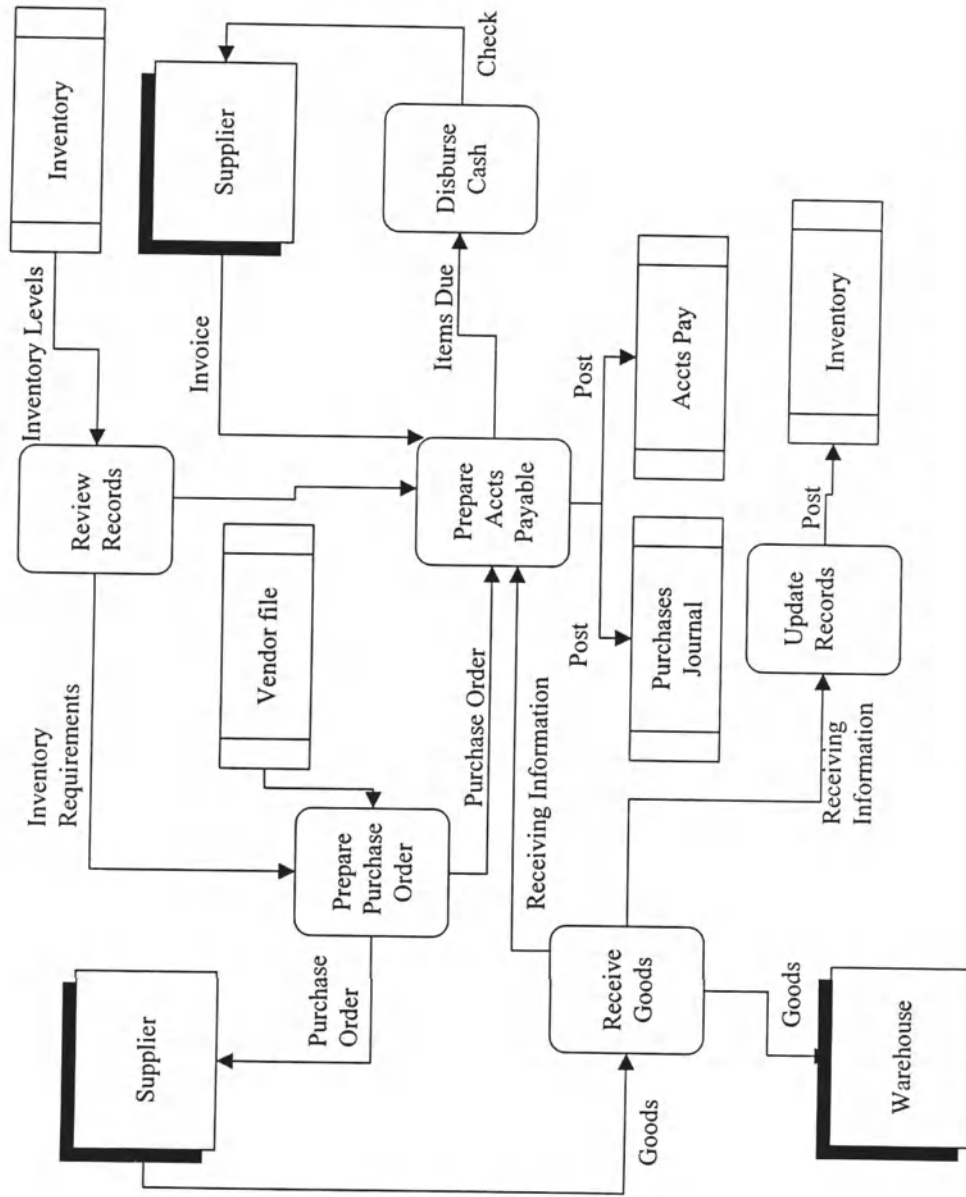
Arrows represent the flow and direction of information within the diagram.

11.

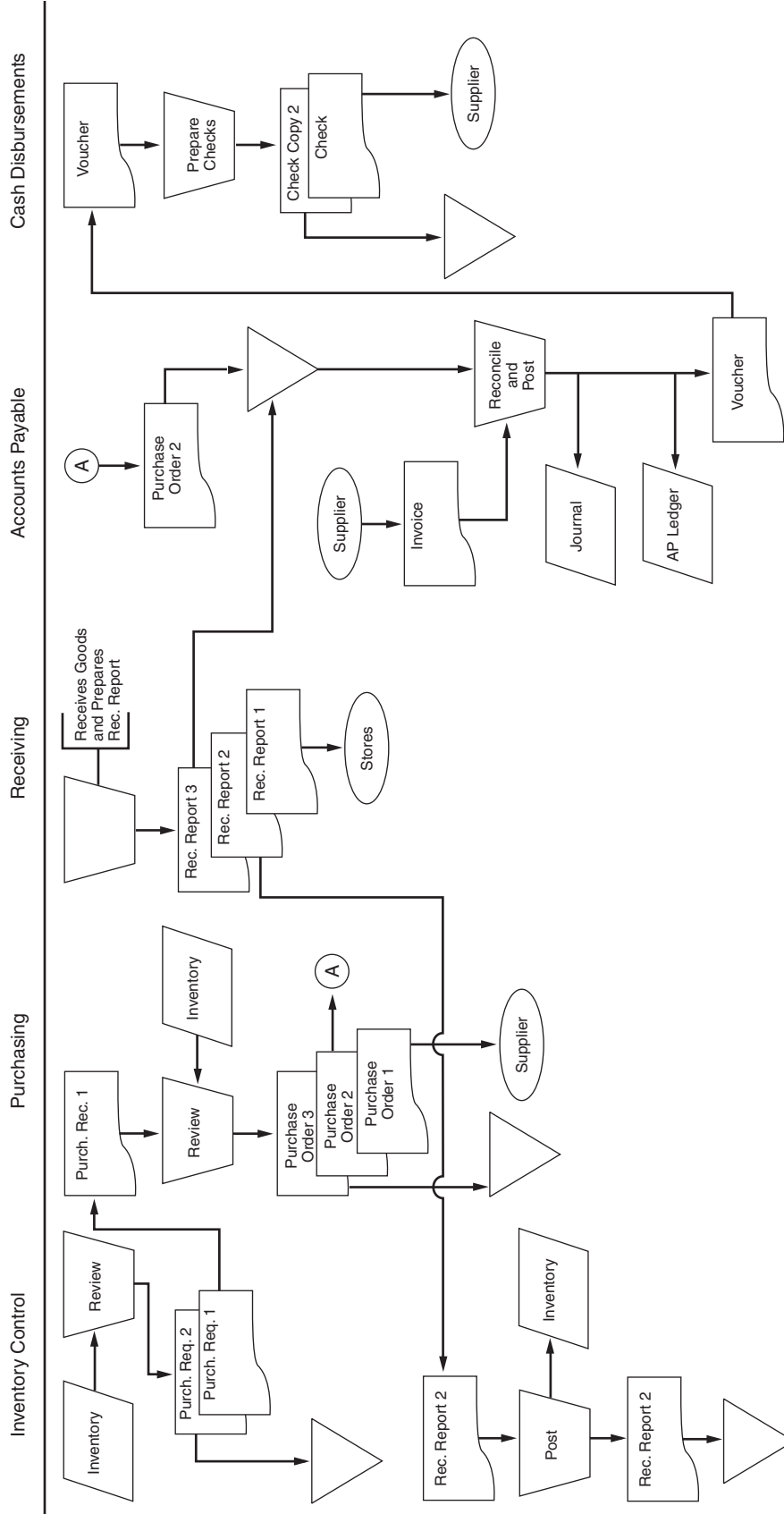


12. See the drawings on the following two pages.

solution to problem 2-12



Solution to problem 2-12  
Flowchart for Expenditure Cycle



13. Receiving report file

(PK)	(SK)	(SK)	(SK)		
Receiving Report Number	Purchase Order Number	Inventory Number	Vendor Number	Quantity Received	Condition



Purchase order File

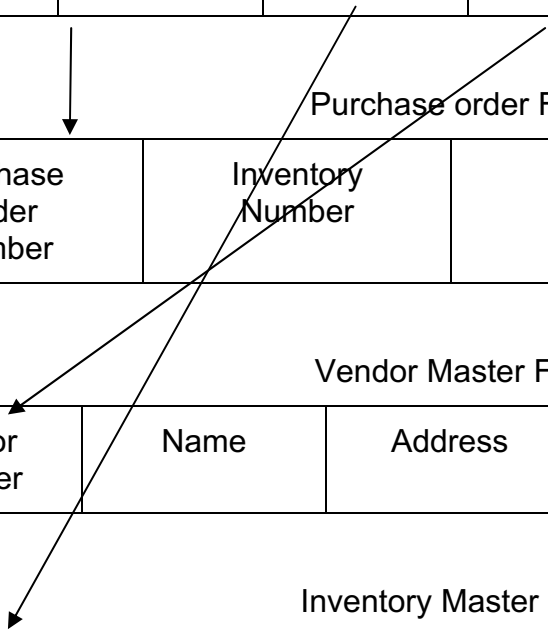
Purchase Order Number	Inventory Number	Vendor Number	Quantity Ordered
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Vendor Master File

Vendor Number	Name	Address	Balance	Terms
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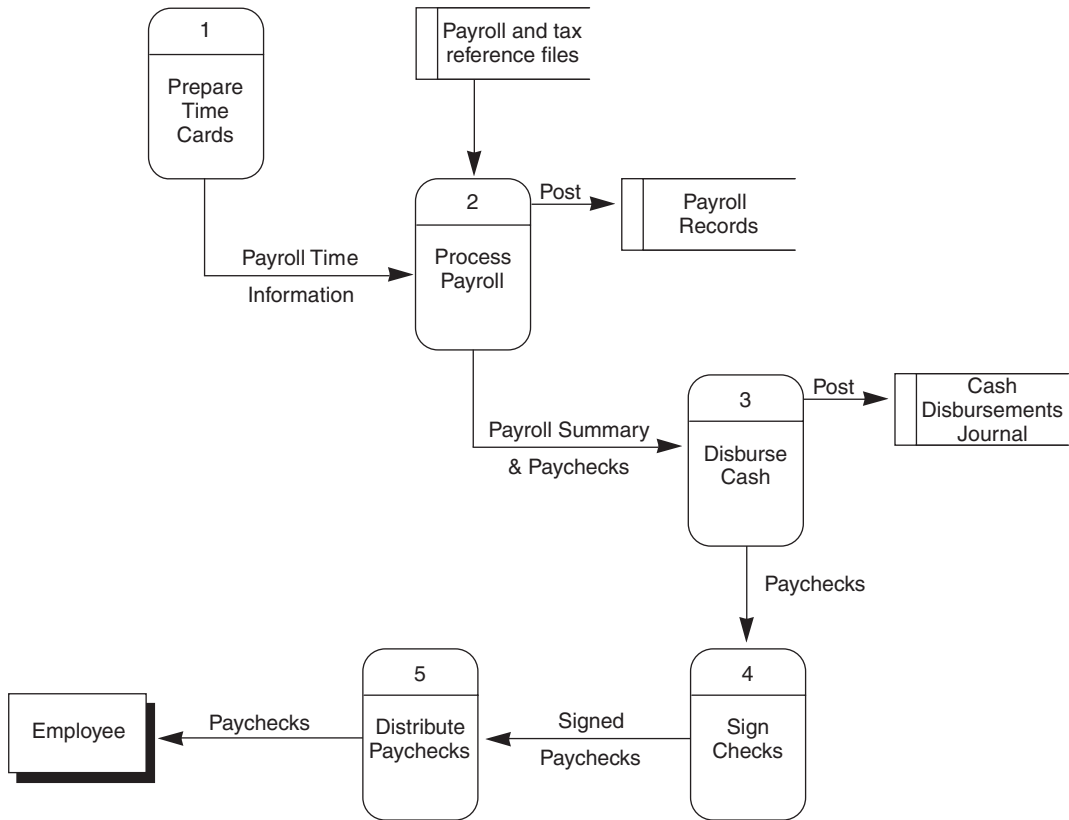
Inventory Master File

Inventory Number	Description	Quantity On Hand	Reorder Point	EOQ	Unit Cost
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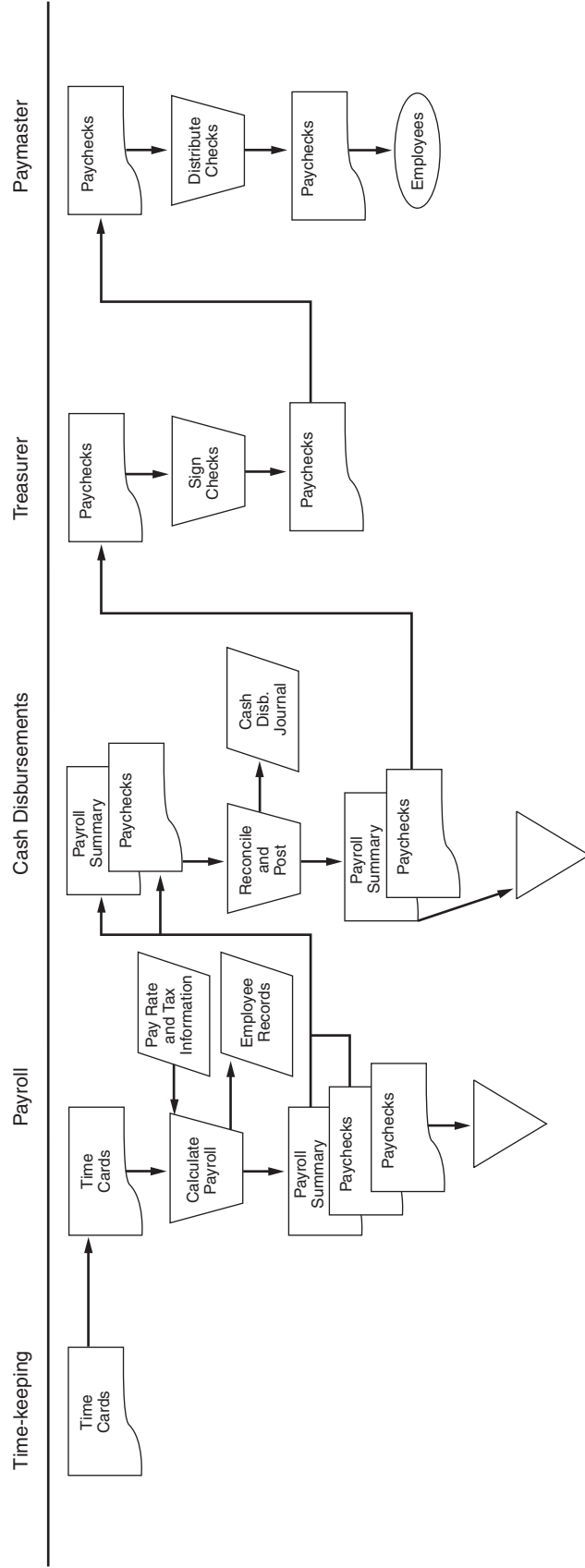
14. See drawings on the following pages.

Solution to Problem 2–14  
Data Flow Diagram for Payroll



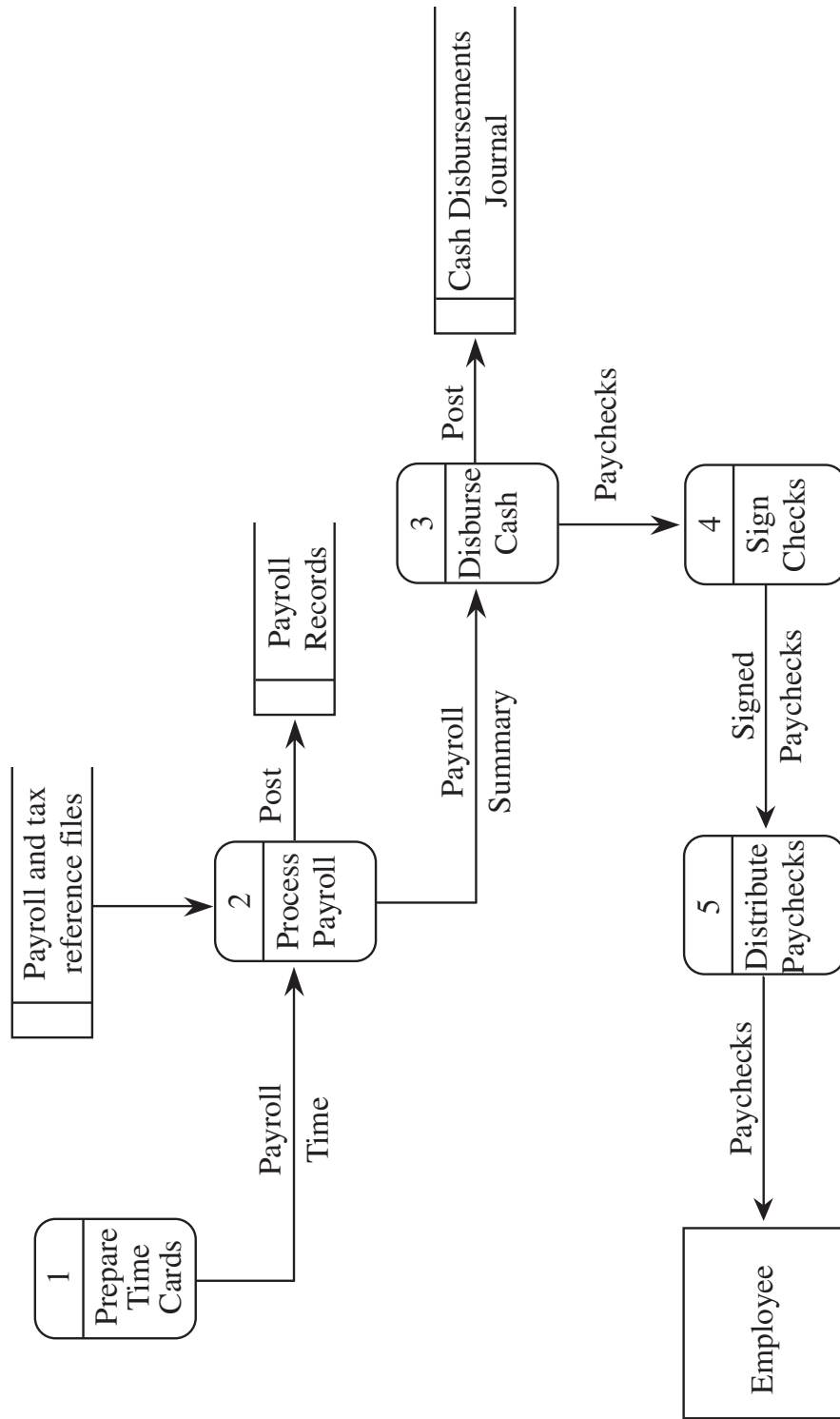


Solution to Problem 2-14  
Flowchart for Payroll

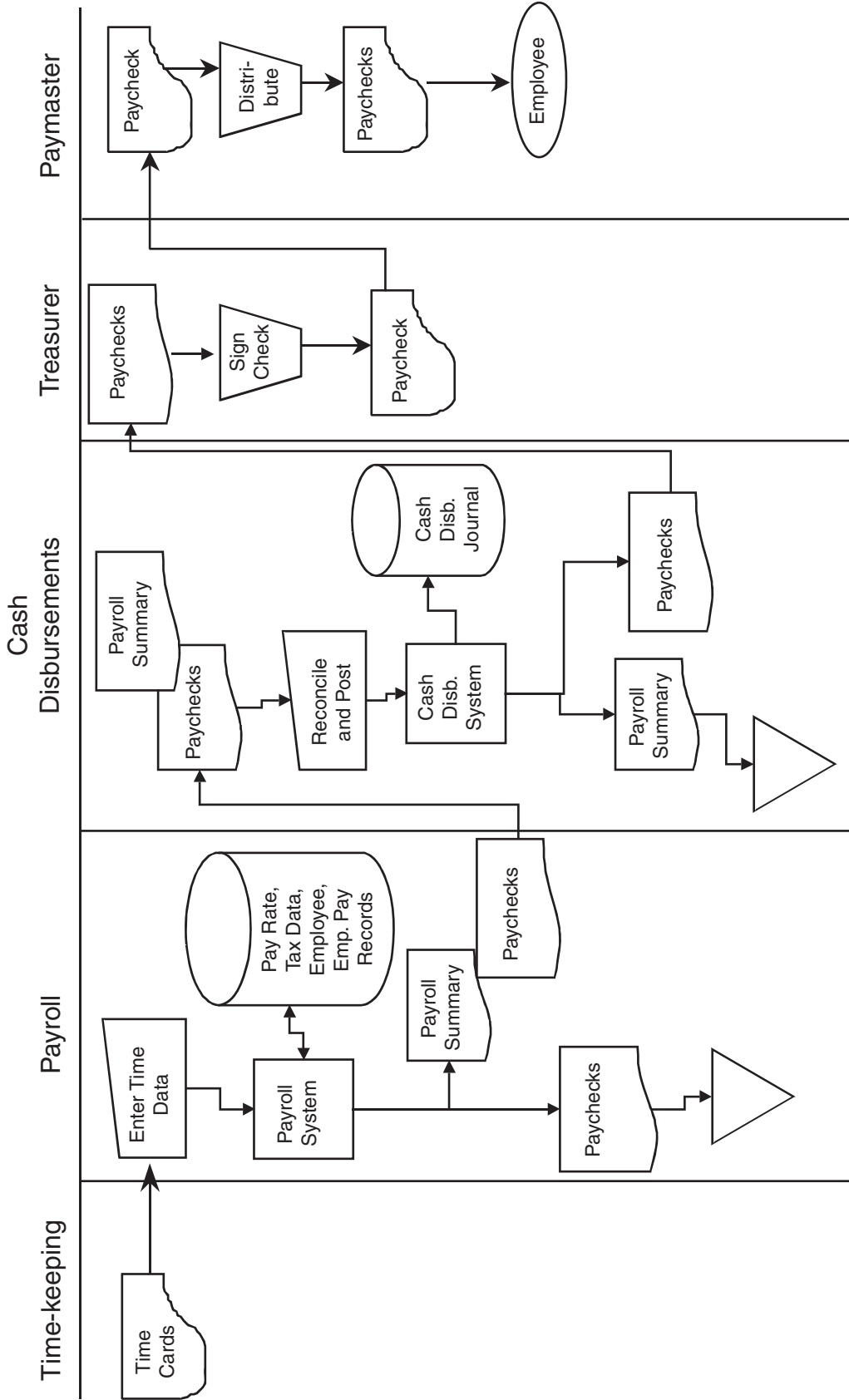


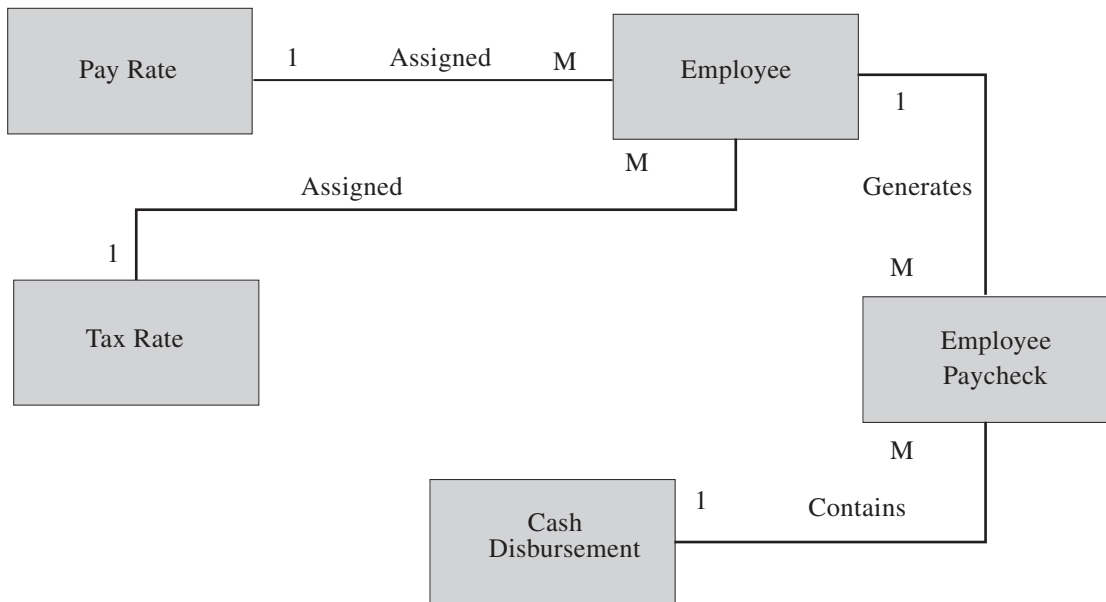
15 See the data flow diagram, ER diagram, and flowchart on the following pages.

Data Flow Diagram for  
Solution to Problem 2-15



Solution to Problem 2-15  
Flowchart for Computer Payroll System





16.
  - a. indexed sequential or indexed random; least optimal: sequential
  - b. indexed random or hashing; least optimal: sequential
  - c. sequential; least optimal: indexed random
  - d. sequential or pointer; least optimal; indexed random
  - e. indexed random or hashing; least optimal: sequential
  - f. indexed random or hashing; least optimal: sequential
  - g. indexed random; least optimal: hashing
  
17.
  - a. A sequential file could be used, but with only eight updates per month, roughly 1/8 of the files will be updated each run. That means for each run the other 7/8 of the file must be read and rewritten. Random access will aid the customer inquiry response time. A hierarchical database would be appropriate since this is a one-to-one relationship—each address has one resident in charge of utilities.
  - b. Random access for customer balances and payment information is crucial. A network or relational database is necessary since this is a many-to-many relationship: many purchases per customer, many merchants per customer, many customers per merchants.
  - c. Random access will be necessary for flight inquiries and updates throughout the day. A navigational database would be appropriate. Only one direction needs to be investigated. Most customers start with a departure city and then flights to the destination city can be investigated. Many different destinations will exist for a given departure city. Rarely will a customer wish to book a flight based on a destination where they do not know from which city they will depart.
  - d. A random access storage device is necessary to access the students' records quickly when they check out books. A network or relational database will be necessary since the data should be bidirectional. An investigation may need to be conducted to determine what books a student has checked out or an investigation may need to be conducted regarding who has a certain book checked out that has been recalled.
  
18.
  - a. The documents in the expenditure cycle include a purchase requisition, a purchase order, the vendor's invoice, a receiving report, and a check.
  - b. Each of these documents is a source document with the exception of the check, which is a product document.
  - c. The journals used in the expenditure cycle include the purchases journal and the cash disbursements journal.
  - d. The two journals stated are both special journals.
  - e. The ledgers used in the expenditure cycle include the general ledger and the accounts payable subsidiary ledger. It is also possible that a subsidiary ledger for inventory to be used.
  - f. The general ledger is a general ledger and the A/P subsidiary ledger is a subsidiary ledger.

19. a. Only the backup files can be presumed to be uncorrupted.  
 b. The clerk will have to reenter the data for the previous day's sales.  
 c. The company will first have to restore the backed up data to the computer. Once the clerk has reentered the sales data, this new transaction file will have to go through the edit process. Finally, an updated master file(s) may be generated and then a new backup file created.
20. 9997/3=3332.333333333333  
 9997/2307=4.333333333333  
 9997/39=256.333333333333

These numbers are identical with respect to location. The record with key=3 will be stored in cylinder 33, surface 33, record number 3333.

The record with key=2307 will be randomly stored elsewhere and a pointer will be attached from the record with key=3 to the location of the record with key=2307. The record with key=39 will be stored at yet another random location and another pointer will be attached to the record with key=3 giving the location of the record with key=39.

21. The following list illustrates, step by step, the update procedures for a sequential file update process.

t=1 m=1 t=m	update m=1
t=6 m=2 t>m	skip m=2
t=6 m=3 t>m	skip m=3
t=6 m=4 t>m	skip m=4
t=6 m=5 t>m	skip m=5
t=6 m=6 t=m	update m=6
t=8 m=7 t>m	skip m=7
t=8 m=8 t=m	update m=8
t=9 m=9 t>m	update m=9
t=10 m=10 t=m	update m=10
t=13 m=11 t>m	skip m=11
t=13 m=12 t>m	skip m=12
t=13 m=13 t=m	update m=13
t=11 m=14 t<m	ERROR! write to error file
t=15 m=15 t=m	update m=15
t=17 m=16 t>m	skip m=16
t=17 m=17 t=m	update m=17
eof m=18	stop

The error in the order of the file causes record 11 in the master file to be incorrect since it is not updated. This record should be written to an error file.

If a direct access method is used, no errors would occur because of the out-of-sequence condition of transaction file records.