EE4001/IM2001 Software Engineering
Tutorial 3 and Sample Answer

1. Check the data flow diagrams shown in Figure A and B to verify their correctness. List all the errors found.

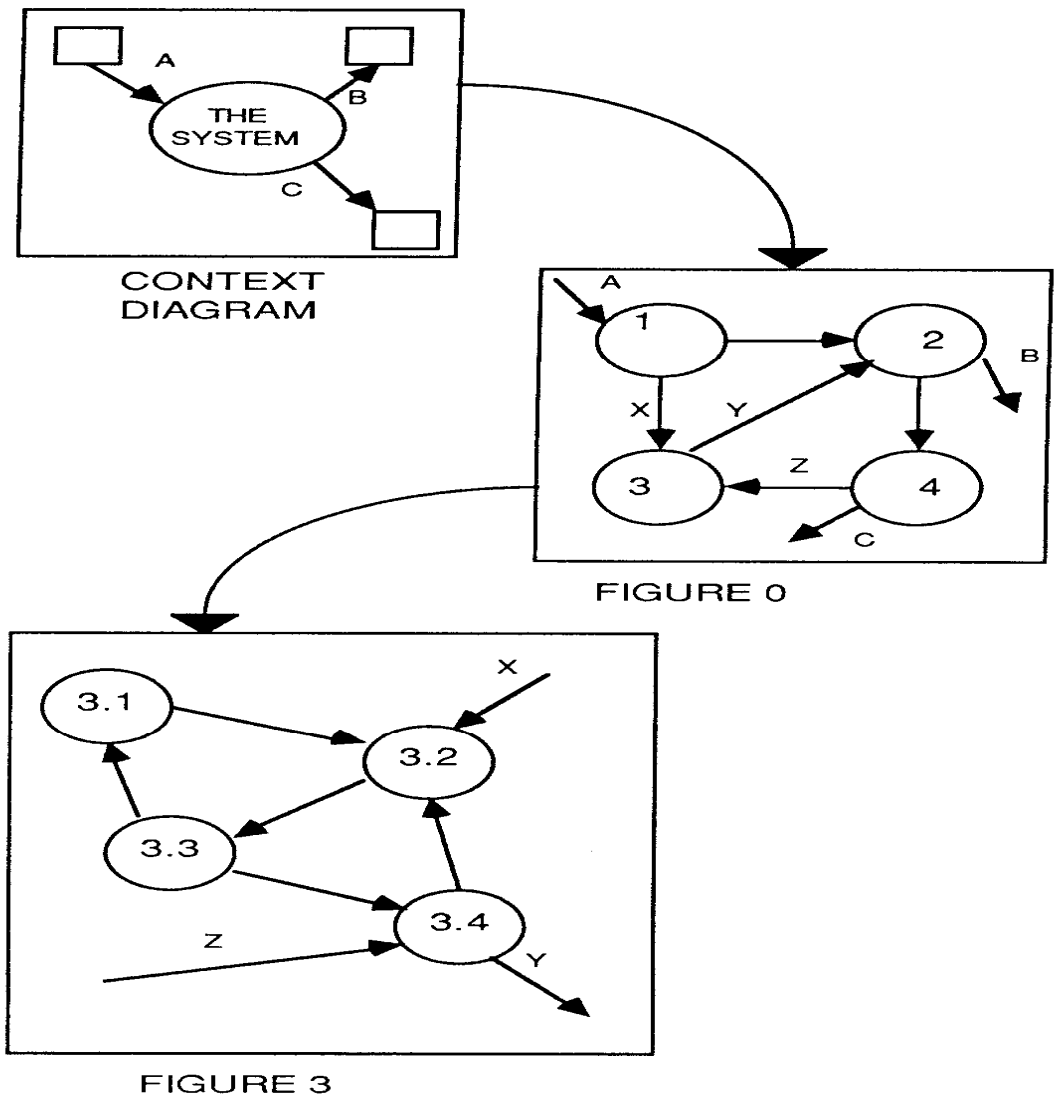


Figure. A

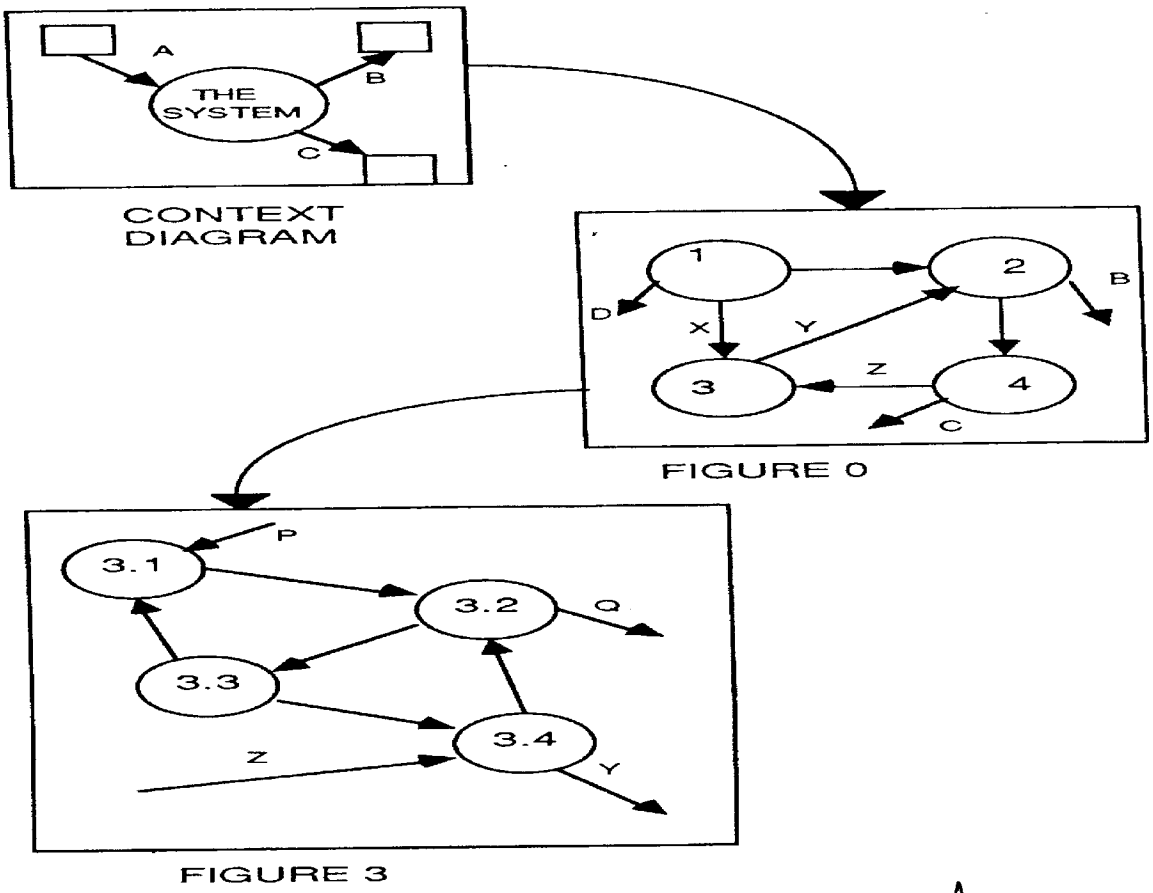


Figure. B

without source : from nowhere

without sink: to nowhere

Q1 Answer

Figure A: no error

Figure B: out of balance

Figure 0:

1) Process 1 does not have input data flow
2) D to nowhere
3) A from the Context Diagram is missing

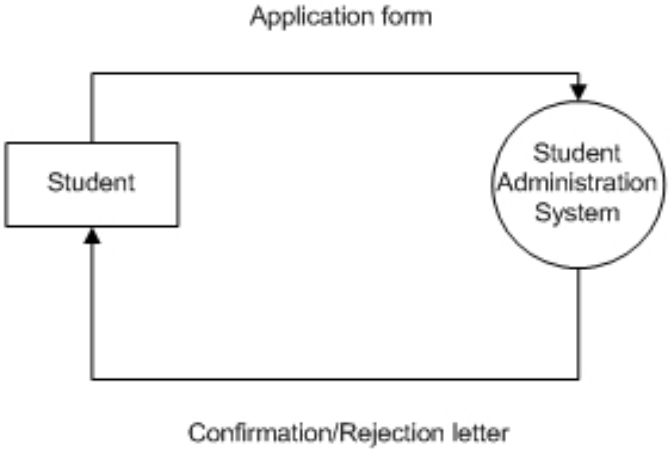
Figure 3:

1) p from nowhere
2) Q to nowhere
3) X from Figure 0 is missing

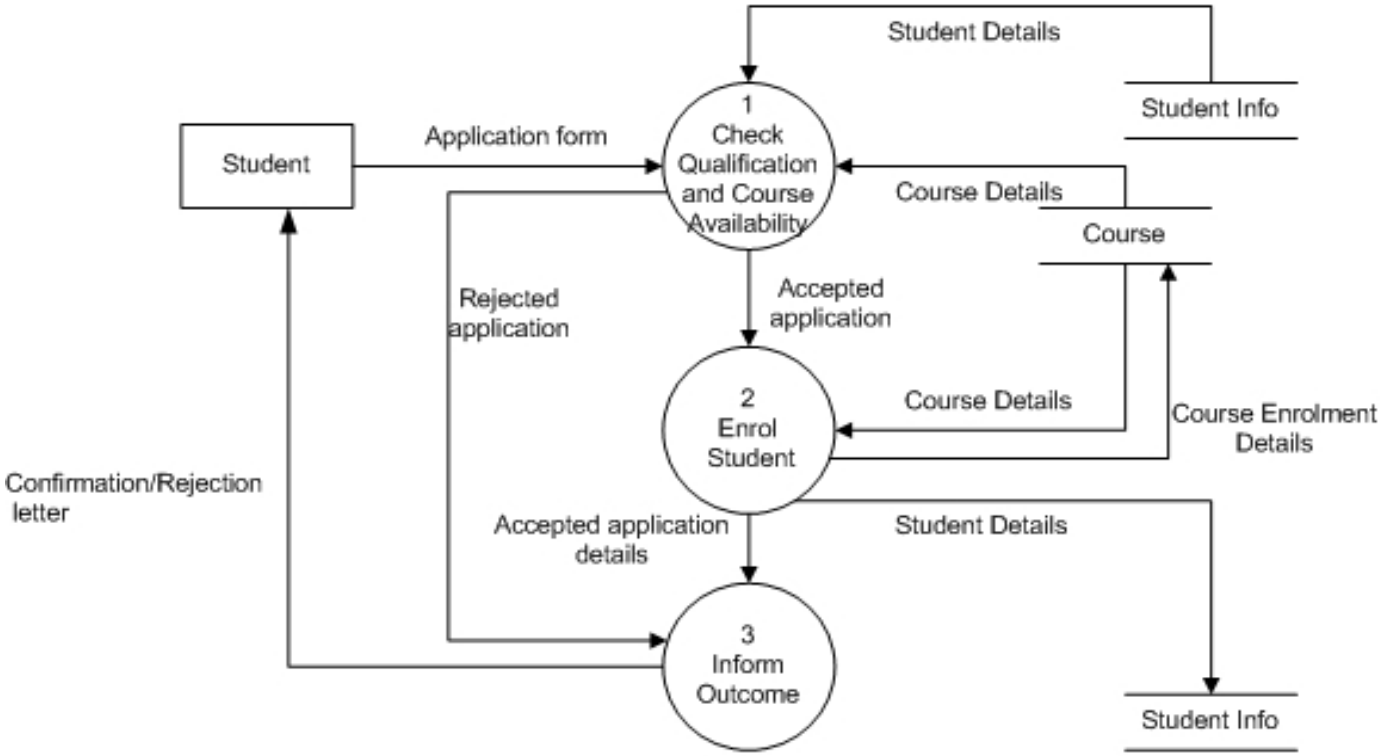
Q2. Draw the DFD for a distance education university. The enrolment process works as follows:

Students send in an application form containing their personal details, and their desired course. The university checks that the course is available and that the student has necessary academic qualifications. If the course is available and suitable, the student is enrolled in the course, and the university confirms the enrolment by sending a confirmation letter to the student. If the course is unavailable the student is sent a rejection letter.

Q2 Answer:



Level 0 diagram



Level 1 diagram

Q3. The authentication and validation of customer and the validation of the requested transaction performed by a bank autoteller machine (ATM) are carried out as follows:

(1) The validation operation requires inputs from the customer's card, from the customer (in the form of the personal identification number or PIN) and from a network directory. The first two of these are used to authenticate the customer's identity, while the third ensures that the card (which may be issued by a different financial institution) is acceptable to the machine.

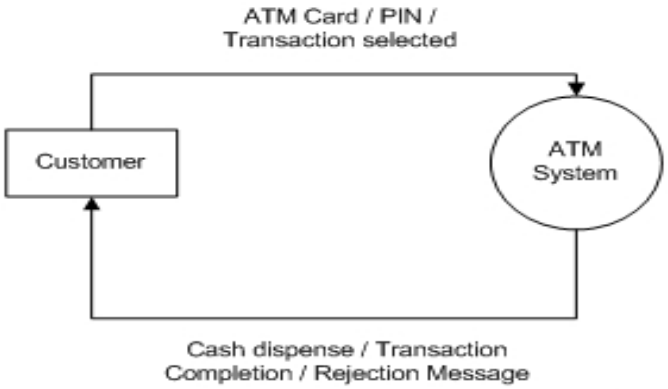
(2) The outputs from the above process are then concerned with either acceptance (proceeding to the selection of the required transaction by the customer) or rejection (which may involve returning or retaining the card). Even if permission is given to proceed further with the transaction, there will be a further validation process involved to ensure that: (a) the transaction selected is permitted for this customer; (b) the validity of customer account and adequate balance for the withdrawal.

(3) The processing of the accepted transaction is carried out by process ATM transaction. This process will dispense cash or send completion message to customer depending on the type of transaction. The details of this process are excluded from this question.

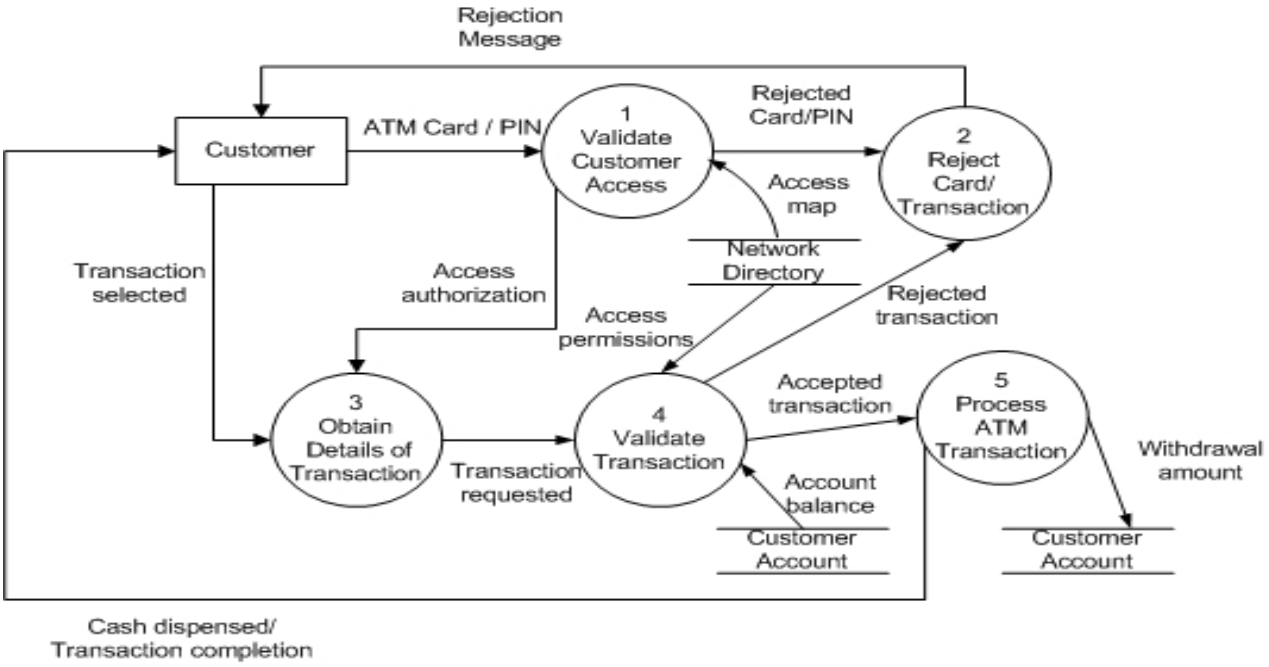
Furthermore, the authentication and validation of the customer includes checking the readability of card, reading of details from card, checking of expiry date and the right bank group, and requesting the entering of PIN from the customer for checking with maximum of three attempts provided.

Draw the context diagram, the level-1 diagram and a level-2 diagram for the details of the authentication and validation of the customer. Does DFD cover control flow (that is the sequence, selection and iteration of processes)? Use this case as an example to explain.

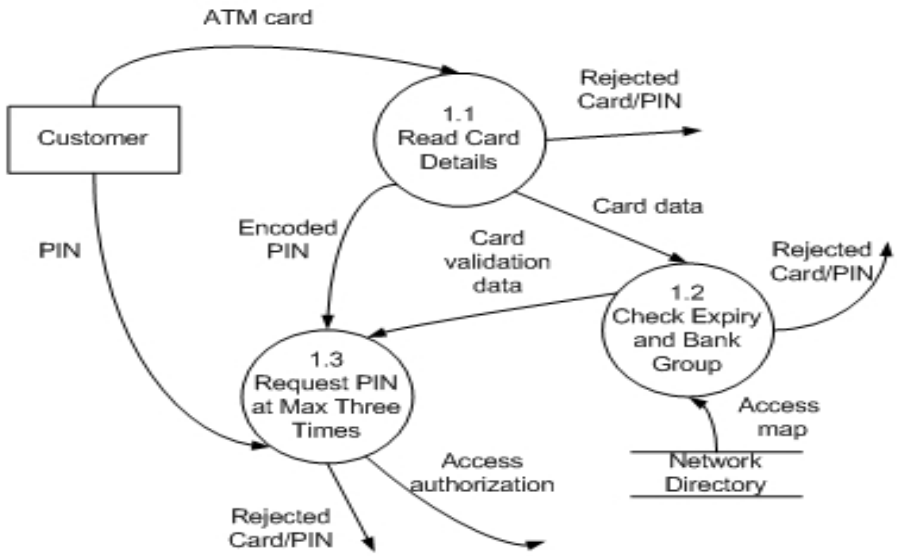
Q3 Answer:



Level 0 diagram

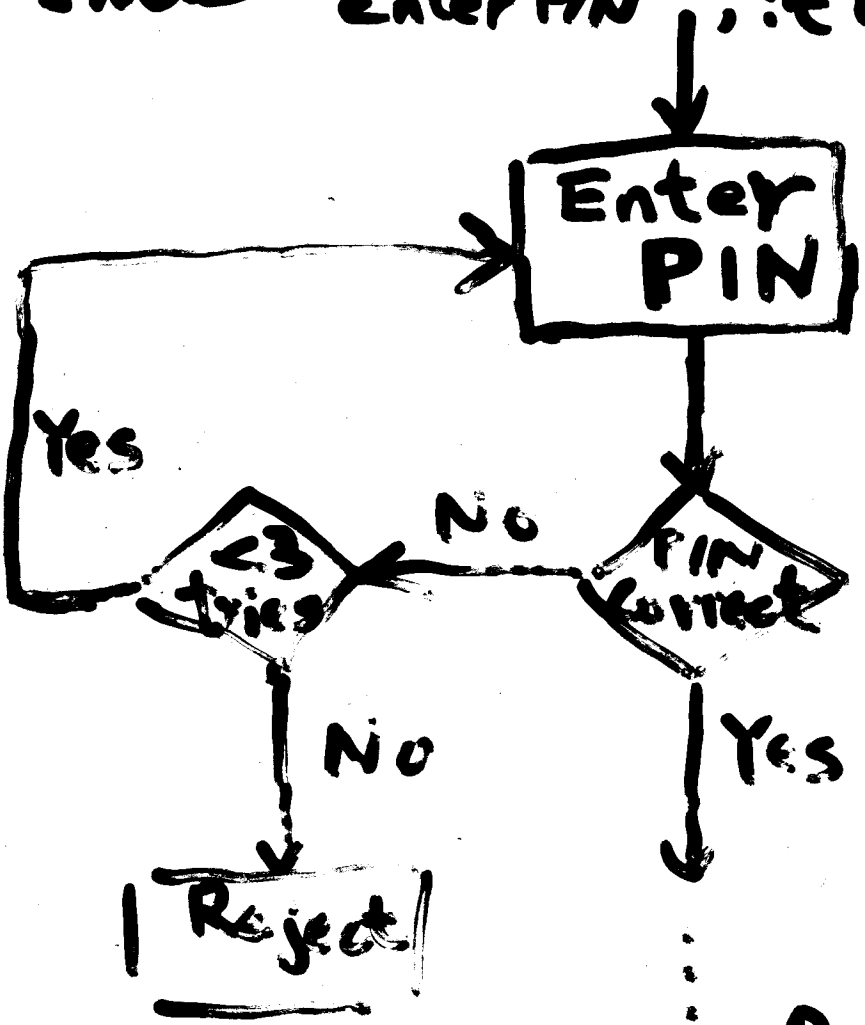


Level 1 diagram



Level 2 diagram

DFD does not cover control flow. In the above DFD, actually a customer can at most make three attempts for entering the PIN. However, in the process that shows the entering of PIN, process 1.3, there is no looping associated with it to show the possible iteration to permit the customer three attempts at entering the PIN. Note that if we use flowchat to show "Enter PIN", it will be as follow



(a type of control flow)

The looping structure is clearly shown in flowchart.

Q4. Identify the most suitable basic concept from the seven concepts, class, operation, association, aggregation, generalization, object and instance of association, in Object-Oriented modeling to model each of the following:

a) Robert Tan.
b) Employee.
c) Compute interest.
d) Dentist treats Patient.
e) Chapter is part of a book.
f) Postgraduate students can be classified into research and course work students.
g) City Development bids for a piece of land.

Q4 Answer:

a) Robert Tan.
Ans: Object.

b) Employee.
Ans: Class.

c) Compute interest.
Ans: Operation

d) Dentist treats Patient.
Ans: Association.

e) Chapter is part of a book.
Ans: Aggregation.

f) Postgraduate students can be classified into research and course work students.
Ans: Generalization

g) City Development bids for a piece of land.
Ans: An instance of association

Q5 Prepare a class diagram for a graphical document editor that supports grouping, a concept used in a variety of graphical editors. Assume that a document is composed of several sheets. Each sheet contains drawing objects, including text, geometrical objects and groups. A group is simply a set of drawing objects, possibly including other groups. A group must contain at least two drawing objects. A drawing object can be a direct member of at most one group. Geometrical objects include circles, ellipses, rectangles, lines and squares.

Q5 Answer