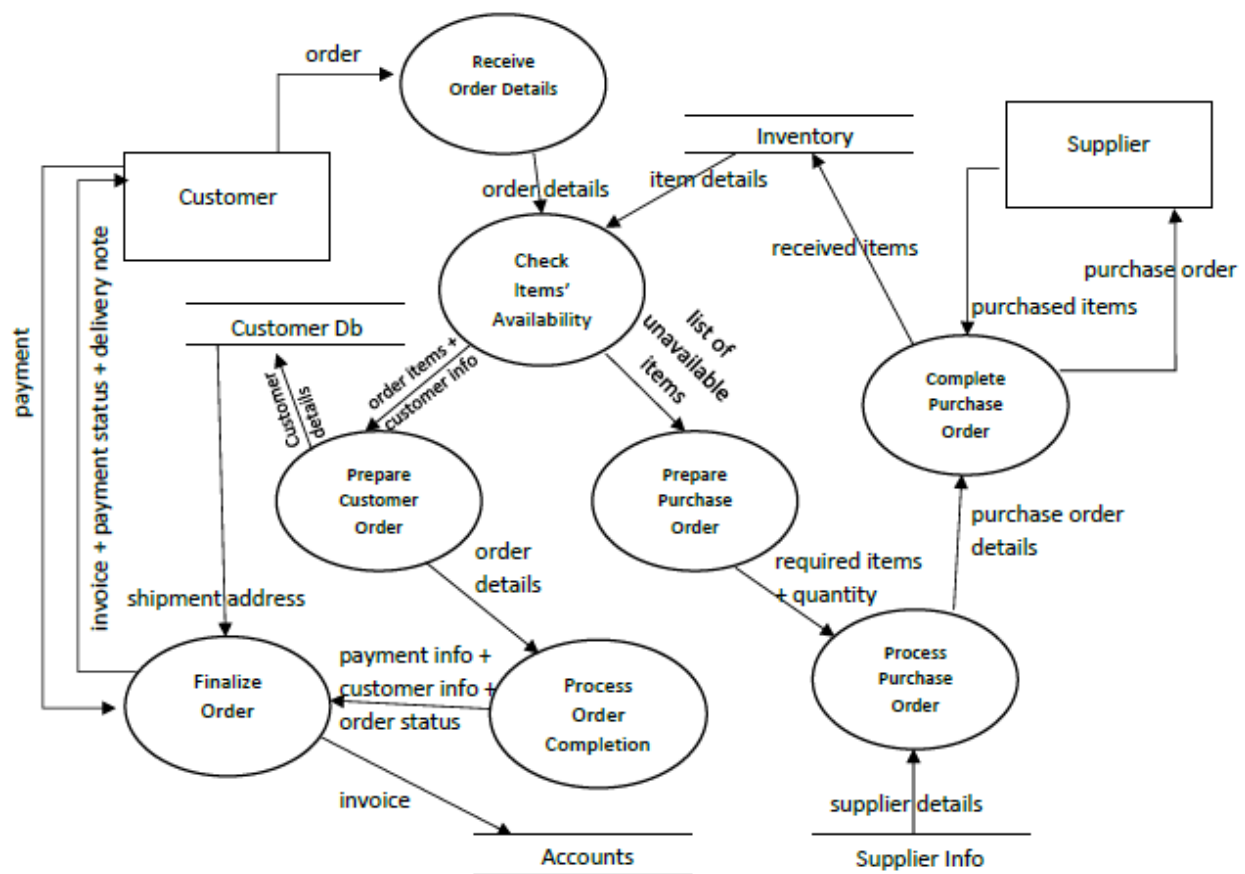


## Practice Questions

Q1. Wasim Tiwana and Nasim Tiwana are two brothers who have been running an electronic items shop for quite a few years. Their customers visit them with the orders and the brothers provide the customers with the required items. In case the required items are not available in stock, Tiwanas immediately request their supplier to send the items. Once the items are received and their stock is enough, they prepare the order and move towards completion of the order. During the completion phase they have to generate an invoice, receive payments, and provide a delivery note to the customers.

Develop a use case diagram for their business

Q2. Consider the business mentioned in Q1. Tiwana brothers have now decided to computerize their system to reduce the paper work involved in recording and processing of the orders. They have hired a software engineer Shamim Khatana who has analysed their requirements and has come up with a Data Flow Diagram (DFD). Khatana being a professional, has been following SE principles and has refined the DFD to the last possible level. This DFD can be seen in the figure below. Khatana's next step is to perform structured design and come up with an architecture of this order management system.



To do:

- a) Is this DFD meeting all the notation related requirements? If no, modify the DFD to make it complete in terms of notation and rules
- b) Which of the processes are potentially 'Not primitive'? If possible, refine the DFD to the next level. If it is not possible, justify why can't this DFD be further refined.

Q3. In most of the software engineering projects the clients are found to be changing their requirements frequently and the software engineers are found to be dealing with the issue of unstable requirements. The requirements keep on changing even when the major portion of the software has been implemented and tested. The software engineers try to incorporate the required changes even in later phases of software development. Malleability is a property of software that allows the clients to change the requirements that frequently and lets the software engineers attempt the implementation of the changes. What issues can arise if this property is exploited? What can a good requirements engineer do to deal with unstable requirements and yet complete (or continue with) the development of the software?

#### Q4. Problem

Distance learning till today is one-way road as only teachers are delivering content or video lectures. In this way students can't ask questions on parts of lecture, which may leave them with ambiguity on some topic(s).

It is hard to maintain hardcopies of lectures for teachers and rewrite them every time they teach the same class. It is not even a good idea for students to maintain their notes in form of hardcopies and do their assignments on papers and the much of the research work they have to do now days is through internet and eBooks. So it is a tough ask for students even to maintain hardcopies of lectures in each semester or year of their college and where there are many chances to lose the back track of their previous lectures and notes.

Secondly, for professional students and the students of practical subjects like Mathematics and Arts, it is necessary to look through problems deeply and ask teachers questions on each point of confusion.

Thirdly, students lose some concentration to lecture, as they get more involved in taking down notes instead of listening to the lecture and grasping what the teacher is pinpointing. This is another vital issue that causes a lack of interest in many students and many fail to get most out of lectures due to this problem.

#### The Proposed Solution

To handle these problems, this project suggests an innovative interface for virtual class environment. The focus of the project is to devise an application that will simulate real-world class environment for distance learning and would provide a platform for teachers and students to perform their tasks with more ease and perfection in a timely manner. The teachers would be able to deliver lectures electronically using tablet (promulgator) that would be automatically copied to the tablets (promulgators) of the students attending the class and they would rather be concentrating on lectures instead of taking notes. Moreover students would be engaging in question and answers in a way to cope up with distance learning interactivity problem. Students would be proposing their answers by writing or drawing the idea at real time on tablet (promulgator) and would be questioning by properly writing and preplanning their query, which would all, be visible at runtime to an online class canvas.

So, the core point is to develop a healthy classroom environment that simulates real-world class environment, which would help students in distance learning and teachers in distance teaching.

**To do:** Your task is to read the above text and list all the functional and non-functional requirements that are relevant with the problem. All the written requirements should be **Testable** (aka Verifiable). All the requirements should follow the standard format and style for writing the requirements.

Q5. We need to develop an automated ticketing system which allows travelers to get the tickets issued and cancelled. The travelers can pay for the tickets through credit cards only. The ticketing system receives traveler's details (such as name, contact number, credit card number) and travel details (such as destination station, source station, travel date, travel time, number of seats, seat preferences) from a Traveler and issues a ticket to the traveler on the basis of availability of seats. The system checks for availability of seats before processing payments and issuing the ticket. The payments are processed based on already set ticket prices. The system contacts the Bank to process the payments and a ticket is issued only when payment through credit card is successful. The system provides the bank with the credit card (cc) information and the payment amount to receive a confirmation of successful payment. On successful payment the system issues a ticket to the traveler and records the information related to the ticket. The ticket has a ticket number, traveler's name, contact number, seating details, travel time, bus details, payment amount etc.

The system is also capable of handling ticket cancellation requests. A traveler needs to provide ticket number when requesting for cancellation. The system contacts the bank with cc information and the amount to be refunded, before sending the cancellation confirmation to the traveler. If a ticket cannot be cancelled, the system informs the traveler about rejection of the request.

To do: Develop a level 0 and level 1 DFD for this system. Refine the DFD to the maximum levels possible. Mention the reason to stop the refinement.

Q6. Suppose we are developing a water-monitoring system where data are gathered at many points throughout a river valley. At the collection sites, several calculations are done, and the results are communicated to a central location for comprehensive reporting. Such a system may be implemented with a computer at the central site communicating with several dozen smaller computers at the remote locations. Many system activities must be considered, including the way the water data are gathered, the calculations performed at the remote locations, the communication of information to the central site, the storage of the communicated data in a database or shared data file, and the creation reports from the data.

To do: Will developing an ER diagram for this system help elaborate the requirements? If possible, then take some assumptions regarding the system and draw an ER diagram.

Q7. Suppose we are developing a system to grant authorized access to lab based on RFID cards. The system will have an RFID module and is intended to prevent unauthorized students from entering the university's research lab. This prevention is done by controlling the lock on the doors. When a person tries to enter the lab, he/she touches his/her card with the RFID modules mounted on the door. The system compares the card holder's record with the records of authorized card holders. The door lock is opened only if the person is authorized to pass through the door.

To do: Which of the elaboration tools (diagrams) are applicable for this statement. Draw all the applicable elaboration diagrams.

Q8. Royal Bank of Kuwait (RBK) needs a banking application that allows its customers to maintain their bank accounts. The system should allow a customer to view account balance and shop online using the bank account number. Customer can also view the status of the account and

change currency of his/her bank account. Some other tasks that a customer should be able to perform include Pay Bills, Transfer Funds (to same or other banks), Request Chequebook Generate Mini Statement, Generate Account Statement for particular period (period not exceeding 1 year), Generate Transaction PIN, Add/Remove beneficiary for fund transfers, and Request Bank draft/Pay Order. The account statement of last 3 years can be requested through this application, the customer must visit bank in order to get more than 3 years old bank statement. Funds Transfer, Bill Payment, Online Shopping should be processed instantly. The account balance should reflect each of these activities within 5 seconds of request.

RBK expects that once the application is developed, their Customers can login through their unique account number and a strong password. But a customer cannot create his account, only Admin, residing in Head Office of RBK, will create new account of a customer. The Admin creates an account on recommendation of a Branch Manager who uses the same banking system to send the recommendations for opening an account. The Branch Manager enters customers' details in respective recommendations and sends the recommendations to create new accounts before the end of the day. Admin must ask the customers to verify their emails before end of the next working day. Account creation will be successful only if a customer verifies an email address by using the link sent during account creation process. Once the email is verified the Admin creates the account and provides a customer a unique login id through a verified email. The password is generated once account creation is successful, but the password is not shared through the RBK banking system. The customer must change the password at first login and password (of minimum length 8) must contain at least one capital alphabet of English, one small alphabet of English, one special character, and one digit. Admin will also be able to update/delete account of a customer, if recommended by the Branch Manager.

To do:

- a. Draw a use case diagram
- b. Draw a sequence diagram for the scenario that ensures the change of password at the first login
- c. Draw a class diagram
- d. Draw an ER diagram
- e. Draw a decision table that specifies the rules to determine if a password is strong or not
- f. Draw a swim lane diagram for the workflows mentioned in the statement (for example creation of an account)
- g. List all the non-functional and functional requirements in the standards format

Q9. Our job is to develop a system to sell advertising time for Piccadilly Television, the holder of a regional British television franchise. As we shall see, the constraints on the price of television time are many and varied, so the problem is both interesting and difficult.

In Britain, the broadcasting board issues an eight-year franchise to a commercial television company, giving it exclusive rights to broadcast its programs in a carefully defined region of the country. In return, the franchisee must broadcast a prescribed balance of drama, comedy, sports, children's and other programs. Moreover, there are restrictions on which programs can be broadcast at which times, as well as rules about the content of programs and commercial advertising.

Piccadilly attracts most of the Audience in Midlands UK. Thus Piccadilly must set its rate to attract a portion of advertiser's budget. One of the ways to attract an advertiser's attention is with audience ratings that reflect the number and type of viewers at different times of day. The ratings are reported in terms of program type, audience type, time of day, and television company. But the advertising rate depends on more than just the ratings. For example, the rate per hour may be cheaper if the advertiser buys a large number of hours. Moreover, there are restrictions on the type of advertising at certain times and for certain programs. For example;

- Advertisements for smoking may be shown only after 9 PM
- If an actor is in a show, then an ad with that actor may not be broadcast within 30 minutes of the show (15 minutes before and 15 minutes after the show)
- If an ad for a class of products (such as an automobile) is scheduled for a particular commercial break, then no other ad for something in that class may be shown during that break.

**Perform the following in the space provided on the next pages:**

- a. Develop an ER Model
- b. Develop a Sequence Diagram for the scenario of assigning a time slot to a commercial keeping in view the three restrictions mentioned in the description. The time slots are assigned by the class SlotAssignmentManager. Pick classes from your class diagram where required.

**Note:** Identify things (nouns) from the description. Determine the same things with different names. Identify the things that are NOT part of the System and those that are part of the System. Determine the things that need to be stored. Determine the things that will be used during execution of the programs only. Determine the behaviors of things that need to be modeled.

Q10. Given the following correspondence chart, identify the test cases which do not correspond to any requirements. Further, identify the requirements for which no test cases exist.

Requirements Identifier →	REQ 1	REQ 2	REQ 3	REQ 4	REQ 5	REQ 6	REQ 7	REQ 8
Test Cases								
TC 1	X				X			
TC 2			X					X
TC 3								
TC 4	X						X	
TC 5				X	X			X
TC 6								

Q11. Relate the elements of “**Entries**” coulumn with the elements of “**Mismatched Entries**” coulumn. Write the most appropriate match in the coulumn named “**Correct Match**”. Write the corresponding letter instead of writing full entry. For example, see that **Agile** in “**Entries**” is matched with **M** in “**Mismatched Entries**”.

Note: “**Mismatched Entries**” coulumn contains more elements than “**Entries**” coulumn. You do not need to map every element of “**Mismatched Entries**” onto “**Entries**”

<b>Entries</b>	<b>Correct Match</b>	<b>Mismatched Entries</b>
ER Diagram		A. Legitimate/Allowed transitions in a system
Fence Diagram		B. Quality requirements
Event Traces		C. Event Management
Testing		D. Static description of a system
Stakeholder conflicts		E. Unification of process
Functional requirements		F. Requirements prioritization
Non-functional requirements		G. Interaction between system and its environment
Agile		H. A sequence of steps
Unified Process		I. A stage in waterfall model
Process		J. Inception, Elaboration, Construction, Transition
		K. Decision Tree
		L. Composition
		M. Scrum
		N. Message Sequence Diagram

Q12. Consider a grocery store where customers can shop using a cart. The customers view a grocery list, select items of desire, fill their cart, and checkout. Checkout means payment is received at cash counter and the groceries in the cart are handed over to the customer. The sales data is then sent to Sales Data Store. The Store Manager monitors the sales data to identify weekly needs of the store and calls the suppliers to procure the needed items. An order is sent to the supplier during the call to the supplier. Weekly orders are delivered by the suppliers. Each weekly delivery is unloaded at first. Afterwards, individual items are sent to stock shelves.

You need to develop a website for the grocery store such that customers can shop remotely. Checkout in case of remote shopping means that the customer is asked to enter shipment address and the groceries are sent to the shipment department who is responsible for shipping the groceries. Remote payments are made through credit card. Checkout requires that there is at least one item in the cart. The website should also enable the Store Manager to identify weekly needs and place order for the required items. Place Order scenario involves the monitoring of sales data and identification of weekly needs.

To do:

- a. Identify Actors
- b. Develop a use case model
- c. Develop a sequence diagram for Checkout scenario
- d. Develop an architecture diagram

Q13. Describe some ways to identify ambiguity in requirements

Q14. For a pet store POS system, generate a user story for customer purchases

Q15. For a pet store POS system, generate use cases for various customer purchases

Q16. For a airport baggage handling system, generate a user story for dealing with baggage that is to be diverted to another flight.

Q17. What sort of problems might you find through traceability matrix that you might not see without one?

Q18. Solve the following problems from chapter 4 of Pfleeger's book: 1, 2, 4, 5, 8, 15, 16, 17, 19, 20

Q19. Solve the following problems from the uploaded book of Pressman: 8.2, 8.3, 8.9, 8.10, 8.11, 8.12,

Q20. Draw a context-level DFD for the following systems, take whatever assumptions you want:

- a. A network-based course registration system for your university
- b. A web-based order processing system for a computer store
- c. A simple invoicing system for a small business
- d. An automated cookbook that is built into an electric cooking range or microwave

Q21. From the list of systems given in Q20, write a high level narrative for one of the systems of your interest. Using the context level DFD developed in Q20 and the narrative written in this question, develop level 1 and level 2 DFDs. Use 'grammatical parse' on the narrative to get yourself started (to develop level 1 DFD). Specify all information flows by labelling all arrows. Use meaningful names for each transform.

Q22. Consider the following description for a web-based Pothole Tracking and Repair System (PTRS):

Citizens can log onto a website and report the location and severity of potholes. As potholes are reported they are logged within a 'public works department repair system' and are assigned an identifying number, stored by street address, size, (on scale of 1 to 10), location (middle, curb, etc.), district (determined from street address), and repair priority (determined from the size of the pothole). Work order data are associated with each pothole and include pothole location and size, repair crew identifying number, number of people on a crew, equipment assigned, hours applied to repair, hole status (work in progress, repaired, temporary repair, not repaired), amount of filler material used, and cost of repair (computed from hours applied, number of people, material, and equipment used). Finally, a damage file is created to hold information about reported damage due to the pothole and includes the citizen's name, address, phone number, type of damage, dollar amount of damage. PTRS is a web-based system; all queries are to be made interactively.

To do:

- a. Develop a complete set of CRC cards for the PTRS
- b. Develop a use case diagram for the PTRS
- c. Give an architecture diagram for the PTRS

Q23. For the Waiters on Call system (uploaded already) develop an architecture diagram and all the applicable elaboration techniques.

Q24. Develop an architecture diagram for your complete SE term project.