Exercises

1.   Passenger Reservation System
Assume that ABC Bus Corporation has approached you for computerizing their bus reservation system for various destinations originating from Bangalore. The Corporation has currently about 1000 buses spread over 60 routes operating from Bangalore to various places. Of them, 700 are regular, 200 are semi-luxury, and remaining are super deluxe buses. The seating capacity are 48, 42 and 36, respectively.
The Corporation would like to have at least one week advance reservation. The details required to be provided by the passenger would be date of journey, starting point, destination, number of seats (half or full), concession required, if any, route no., and departure time of the service. If seats are available, your system should be able to provide enquiry services in a variety of ways to help the passenger take a decision.

- What is the route nos., which halt at the place requested by the passenger either as a final destination or as an intermediate point?
- Whether seats are available by same route no. but at a different departure time.
- Whether seats are available by a different route no. on the same day.
- The earliest date on which seats are available for a place by a given route no.
- The cost of travel by various categories of buses (namely, ordinary, deluxe, etc) to a destination by various routes.

The above are some of the questions that could be asked by the customer.
Two seats are reserved VIPs and/or emergency quota. However , if nobody turns up for the same, upto half an hour before the departure, the seats are allotted to those in the waiting list according to priority.
Concessions are given in respect of students during summer vacation. Thus they need to pay only 50% of the actual fare. Employees and their eligible family members may travel free once a year, by producing the appropriate identity cards. Your system must verify that the total distance travelled by such a person does not exceed 3000km. Seats are not allowed for half ticket but a seat may be allotted for half tickets issued.
You system should provide a facility for cancellation. 10% of the fare shall be forfeited if the cancellation is done atleast two days prior to the journey. 20% shall be forfeited if the cancellation is done one day prior to the journey but not more than two days, 25% if done 8 hours and 40% for less than half an hour and up to half an hour after departure of the bus. In all other cases the amount is forfeited. The reservation fee of Rs. 5 is always non-refundable. Journey can be postponed/advanced subject to availability of seats by the same route at most once at no extra cost.
Your system would have to maintain a database of various routes originationg from Bangalore and the fare by each of them for various categories of buses to various destinations. Frequently the Corporation revises the fares and your system should accommodate this. Assume that more than one counter is simultaneously active for reservation/cancellation.

2.   Hostel Information System
Assume that your college hostel authorities have approached you for developing a computerized information system that can handle hostel room allotments and keep track of them.

You are quite familiar with the hostels. As first step, catalogue the details such as various hostels, their capacities, types of rooms, i.e., single/double/spacious double/married students apartments etc. Assume a suitable figure for ladies hostel also. Since the number of rooms are less than the number of students, some students have to share a room. Assume that research students are given priority, followed by M.E. and B.E students. Married students are given married students apartments, if available; else they fall into general pool.

Find out how many students join/leave every year in each of the college programmes. A student is allotted a room on joining as follows: If the student is married and married students hostel is available and all others senior to him in his category have been allotted an apartment; else he gets only single/double/spacious double room.

- If the student is unmarried; or he is married but no married students apartment is available, he gets either a single/spacious double/ double room, i.e., if a single room is available and all others senior to him in this category (viz., Research/ M.E/B.E) have been allotted the same, he also gets a single room; else he has to be given a spacious double room. If that also is not available then allot him a double room. Priorities based on course (Research, M.E., B.E) and within that date of joining is to be maintained so as to give a student a better room as and when it is available. Your system should maintain a list of hostels, rooms and details and should be able to,
- Give the lists of available rooms, those occupied, those likely to become free, etc.,
- Intimate students as and when their priorities increase about the new rooms which are available and handle room allotments,
- Prepare a list of students who do not vacate their rooms even after the last date of vacating their rooms after their course is over, and
- Allow students to change rooms within the same class either mutually or to any other vacant room of the same class.

3.   Hospital Automation

Consider the operation of a medium size hospital. Patients data are stored and retrieved. Further, data about the various types of and number of wards/beds/operation theatres available and allotment of wards to patients are also maintained. The hospital authorities are interested in computerizing this information.

The hospital has three types of operation theatres: A, B and C, respectively used for major, minor and small operations, respectively. Wards are of two types: general and special. General wards have capacities of 4 and 8 beds while special wards are either single or double beds. The hospitals also has a maternity ward with 25 rooms, each of which can accommodate 2 beds. The hospital has 20 general wards of capacity 4 and 30, general wards of capacity 8. It has 20 special wards with 2 beds each and 10 special wards with single bed. Moreover, the hospital has an intensive care unit with a 5-bed capacity.

The charges are given in the table below(Rs.).

	General		Special		Maternity
4-bed	8-bed	Single	Double		
200	150	400	300		250

Intensive care unit costs Rs. 1000/- per day.

The doctor notes down the clinical details on the patient's card, which contains the following details. The name of the patient, address, date of visit, doctor's name etc.

If the patient has to be admitted, other details such as bed no., ward no., type, and date of admission are noted. If the patient has been recommended or desires a special ward but is currently not available, he may be admitted in a general ward and later transferred when a bed is available.

Operation costs are not fixed and are determined on a case by case basis. When the patient is discharged, the bed charges should be computed. To this should be added costs of medicine, treatment, consultation fees, operation charges if any, and laboratory charges. Assume that another subsystem of hospital information system gives you these details and is available.

Your system will have to compute equipment charges for those used by patients. Whenever an equipment is used by the patient, the details are noted. Assume that the available equipment are X-ray machine, infra red radiation generation machine, scanner, ultrasound machine, etc. The charges are based on number of exposures incase of X-ray at Rs.50 per exposure. The others are based on number of hours of usage, at Rs. 100, 150, and 200, respectively

All the above costs are to be added and presented in final bill. Your system should keep track of patients data, history ward/equipment usage to calculate other costs, ward/bed allotted or otherwise, operation theatre used.

The following problems are encountered by the hospital:
- Currently the hospital is not able to keep track of the free/allotted wards/beds and their details due to frequent shifting of the patients, difficulty in tracking both wardwise and patientwise.
- Patients data, especially history is also difficult to extract.

Your system should be able to provide the following information:
- Details of a patient such as when a patient was admitted, his or her charges, facilities used, date of discharge, etc.
- State of beds/wards, free/occupied etc.

4.   Insurance

The Bangalore divisional office of XYZ Insurance Corporation of India desires to have computerized information system and has approached you for developing the same. Assume that the Corporation offers 2 types of policies, namely, endowment and money-back. The endowment policy operates as follows: the policy holder pays premium until the maturity of the policy or his death, at which time the sum assured and bonus is paid to the holder or the nominee respectively.

The money-back scheme differs in that 25% of the sum assured is paid back to the holder after expiry of every quarter of the policy term. For instance, consider a policy for 20 years and Rs. 50,000 sum assured. Rs.12,500 would be paid back to the holder at the expiry of 5,10 and 15 years, respectively. At the maturity of the policy the remaining Rs12500 and the bonus would be payable. In case of death the remaining amount of the sum assured and bonus would be paid back to the nominee. Assume that the Bangalore division has 100,000 policy holders and 150,000 policies of which 20,000 are money back.

(i)   Endowment policy. The premium to be paid is worked out based on age of the person proposed and the term of the policy. The sample table given below shows the annual premium payable (in Rs.) for an assured sum of Rs. 1000. The sum assured should be a multiple of Rs.1000 and the minimum is Rs10,000.The minimum term is 15 years. The minimum age at entry is 18 and the maximum is 45.Premium can be paid monthly, quarterly, half-yearly, or annually. Form tables for the above cases using these data as guideline. While designing the tables keep in mind that the total premium paid should be slightly lower incase of annual mode of payments, and the highest premium should be for monthly payments, and the highest premium should be for monthly payment.

Age at entry	18	25	30	35
Policy term				
15 years	70	72	74	76.25
20 years	52	53	54	56
25 years	41	42	42.75	44
30 years	34	34.5	35	-

(ii)   Money –back policy. The premiums are much higher than the endowment case. Typically they would be Rs 10-20 more for every Rs 1000 sum assured. The Amount paid as bonus by the Corporation on maturity is currently Rs.65 per Rs 1000 sum assured. This amount may be revised every year by the Corporation depending on the profits. This holds for both types of policies. Policies may lapse if the holder does not pay the premium for more than to two years. However, it can be paying penalty charges if the period of lapse does not exceed five years.

The Corporation has divided Bangalore division into 15 zones for its convenience. Each zone has a zonal manager. The Corporation also has several agents to procure business. A proposer of a policy may do so only through an authorized agent. These agents report to the zonal manager. Every zone has a number of agents allotted, typically ranging from 10 to 20. Every agent must procure a minimum of 10 customers and a policy value (combined) of at least Rs.1.5 lakhs in order to retain his agency. Agents get commission as follows: 25% and 5% in every subsequent year. Your system should keep track of zones, agents, policy holders and their details. In addition

to operational information, your system should handle queries such as the following:

- Which agents perform consistently well/badly?
- Which areas can be assigned to more agents and which have already too many?
- Which type of policies perform well/badly?

5.   Book Publisher's Assistant

This system attempts to help a book publisher in maintaining details about his books, customers, receipts/payments, etc. A book may be published afresh or it could be a new Edition or just reprint. The copyright may belong to either the author(s) or publisher. The publisher may reprint any number of copies if he holds the copyright. If the author holds the copyright, he may publish only as much as is asked by the author. Further, the publisher may have to pay royalty in such a case for every book sold.

Various book sellers, libraries, institutions, etc., order books. If the required number of copies is available the publisher sends the books and updates his stock level. If they are not available, he may send a partial consignment provided it is acceptable to the customer. Payments may be either cash/credit, subject to suitable credit limits. The publisher may decide to reprint a popular book if he holds the copyright. Otherwise he approaches the author for consent. The author may also revise it and the publisher brings out a new edition.

Assume that the publisher has published roughly 10,000 books of various titles in various subjects and that roughly 100 new books are oublished every year and that 100 new editions are also brought each year. Assume that 200 reprints of various books are also published. The minimum number of copies published is 1000. On an average about 5000 copies of each book is published.

Your system should provide the following information:

- A list of various customers, libraries, etc., placing orders has to maintained, with relevant details.
- For each customer the list of books ordered with details such as cost, address of customer, date of order, date of delivery, qty.delivered, etc.
- Details of reprints, new editions of books.
- Details of current stock, books and their quantity in publication etc.
- Books published by an author.
- List of books in a given subject
- The books that get sold out fast, the authors who are popular, etc.
- The publisher would also like to send a list of new books published every year to various customers/libraries, etc., with relevant details such as title and author.