

**Problem 1:**

The menu of a coffee company (serves coffee based beverages) contains 5 different beverages and 4 different condiments. A customer can order a beverage and any number of condiments for extra charges. Design a software solution to run the operation of this company.

**Problem 2:**

A teachers at a given school is classified as either a part-time or full-time teacher. Full time teachers are on a salary level different than part-time ones. A teacher is assigned one course to teach. Moreover, teachers may opt to give tutorial on one or more topics of the 6 topics taught by the school. The maximum number of topics that can be tutored by a given teacher is 2. Design a software solution to run the operation of this school.

**Problem 3** (this problem it will be discussed in labs, you should try to work before your lab session):

A modern cement factory utilizes computer controlled furnace. The job of the furnace is to take in chemical material, bring them to a certain temperature (300 C°), and then pass them on to the next phase of the process. Design the controller class of the factory. Be very careful to ensure that bad things don't happen, like draining the material before they reach to the desired temperature, or filling the furnace when it is already full, or heating an empty furnace. You should also understand that there are several control booths that could control the furnace.

**Problem 4:**

(a) A weather forecast station measures different readings on regular basis. The readings include temperature, humidity, and atmospheric pressure. The station also offers a paid service for its subscribers. The service includes notifying the subscribers with the regular readings, and updating a chart, of each of the measured data, of the past 1000 readings to the subscribers. There are various types of subscribers each with its own updating mechanisms. Design and implement a program that manages this communication between the weather station and its subscribers.

(b) Moreover, the weather station updates itself with readings on temperature, humidity, and atmospheric pressure from another remote station that notifies it with updates whenever any of the measurements are not attainable in the main station. Embed this property in your program.

**Problem 5:**

A home theatre system is composed of several subsystems including Amplifier and Projector. In order to play a movie, the Amplifier subsystem must be turned on. In addition, the Projector subsystem must also be turned on. For ease of interface, you are required to design and implement a system that allows users to play out movies with issuing one command only.