**Software Engineering**

**Sheet 2**

**Q1:**

As the head of information systems for a college you are tasked with developing a new student registration system. The college would like a new system to replace its older system developed. The new system will allow students to register for courses and view report from personal computers/Mobile phone attached to the campus LAN/ Wi-Fi. Professors will be able to access the system to sign up to teach courses as well as record grades.

Due to a decrease in federal funding, the college cannot afford to replace the entire system at once. The college will keep the existing course catalog database where all course information is maintained. The college has in an open SQL database and can access to this database from college’s Unix servers. The legacy system performance is rather poor, so the new system must ensure that access to the data on the legacy system occurs in a timely manner. The new system will access course information from the legacy database but will not update it. The registrar’s office will continue to maintain course information through another system.

At the beginning of each semester, students may request a course catalogue containing a list of course offerings for the semester. Information about each course, such as professor, department, and prerequisites, will be included to help students make informed decisions.

The new system will allow students to select four course offerings for the coming semester. In addition, each student will indicate two alternative choices in case the student cannot be assigned to a primary selection. Course offerings will have a maximum of ten students and a minimum of three students. A course offering with fewer than three students will be canceled. For each semester, there is a period that students can change their schedule. Students must be able to access the system during this time to add or drop courses. Once the registration process is completed for a student, the registration system sends information to the billing system so the student can be billed for the semester. If a course fills up during the actual registration process, the student must be notified of the change before submitting the schedule for processing.

At the end of the semester, the student will be able to access the system to view an electronic report card. Since student grades are sensitive information, the system must employ extra security measures to prevent unauthorized access.

Professors must be able to access the on-line system to indicate which courses they will be teaching. They will also need to see which students signed up for their course offerings. In addition, the professors will be able to record the grades for the students in each class.

1. Which software model is suitable for the above system
2. Give in details the system requirements of above system

**Q2:**

You have been tasked to develop the system for a mine pump control system, designed to monitor and pump flood water out of mine shafts.  As underground mining operations take place far below the water table, flooding into mine galleries and shafts is an ever-present danger.  Excessive flooding is clearly a safety hazard for workers, but also has profitability implications ranging from equipment damage to productivity delays, to mine closures in extreme circumstances.

The system to be developed will be required to monitor the water level in each mine shaft using two sensors.  A high-water sensor that measures the maximum acceptable level of flooding in a shaft before pumping begins, and a low water sensor, which measures the minimum level of acceptable flooding and pumping stops.  These sensors are used to start a mine pump.  When the flooding level exceeds the level determined by the high-water sensor the pump is switches *on*.  When the water has been pumped out and the minimum level of acceptable flooding has been reached, as measured by the low water sensor, the pump switches *off*.

In addition to flooding mining is often hindered by methane pockets, where gas seeps into the shafts and galleries triggering an evacuation.  Again, this is a safety hazard, the mining staff won’t be able to breathe, and even more critically, operating equipment may generate sparks which will cause the methane to ignite.  Therefore, the system will include a methane sensor that will be used to trigger an evacuation alarm in the presence of dangerous levels of methane (measured in N parts per million), and switch *off* the pump regardless of the current water level.

The system is used by two key roles.  The first is the *Operator*.  This role is required to log in to the system with a username and password.  Following a successful login, the operator can start or stop the pump if, and only if, the water level is between the high and low sensor limits.  The second role is the *Supervisor*.  A supervisor must verify their security credential as per the operator above. Following a successful login, they can switch the pump on, or off at any time.  For example, a supervisor could run the pump after the flood level has dropped below the level set by the low water sensor.  They could also switch the pump off if the water level goes over the maximum high level of flooding.  In these cases, the supervisors’ actions override the automatic behavior of the pump.  A supervisor is required to “reset” the pump system to re-establish automatic behavior.

Finally, to meet Federal monitoring standards a persistent log is required to capture the following events:

     Pump switched on by high water sensor

      Pump switched off by low water sensor

      Pump switched on or off by operator or supervisor

      Evacuation alarm triggered by methane sensor

      The reading of the methane sensor every 30 minutes

The reading of the methane sensor (for the last 24 hours) can be read by the operator.  All readings (up to 30 days) can be read by the supervisor.  The supervisor also has the capability to add a “note” to any specific log event that occurs within 24 hours.

1. Which software model is suitable for the above system
2. Give in details the system requirements of above system

**Q3:**

A company specializing in consumer electronics requires an order processing system to be developed that is easy-to-use by its employees, and provides a good response time of less than five seconds. Orders are received from customers online who must state the items and expected delivery deadlines. The orders are recorded and prioritized according to stock availability, transport capacity, delivery deadlines, and time of order. The output from the system will be the price of the order, and the delivery date. The customer then has the option to confirm or reject the order. Using an appropriate modelling technique with supporting notation, and stating any assumptions made, produce the summary of the problem requirements in the form of a table that clearly differentiates functional and non-functional requirements