**Software Engineering**

**Sheet 1**

1) Three examples of software projects that would become amenable to the waterfall model are:

2) As a project manager, your task is to select the appropriate process model for a new, highly risky project that will implement the latest compression and encryption technologies, based on mostly informal requirements. Your development team does not yet possess all the technical skills needed to deliver all aspects of the project. What process model would you choose? Why?

3) Giving reasons for your answer based on the type of system being developed, suggest the most appropriate process model that might be used as a basis for managing the development of the following systems:

a)    A system to control anti-lock braking in a car

b)    A virtual reality system to support software maintenance

d)    An interactive travel planning system that helps users plan journey with the lowest environment impact

 4) 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.

Which software model is suitable for the above system