Answer any two of the following four questions (for example, do 1 and 3, 1 and 2, or 3 and 4 etc).

1. Professional codes of ethics emphasize technical competence. In the ACM Code of Ethics, paragraph 2.2 requires that computing professionals acquire and maintain competence. In the Software Engineering Code of Ethics, statement 2.01 states that software engineers should serve in areas of their competence. In the Code of Ethics of the National Society of Professional Engineers, paragraph II.2 states that engineers should practice only in areas of competence; they must decline tasks for which they are unqualified. For new and emerging technologies such as applications of nanotechnology and artificial intelligence, no professional may be truly competent. How, then, can professionals develop new technologies competently?
2. When engineering and computing professionals create new technologies, it is difficult to foresee consequences, positive or negative. How can professionals create these technologies responsibly? Justify your answer, use examples.
3. Bill Joy was so alarmed by the potential harms of nanotechnology that he advocated that we stop its development. Only a few times in history has technological development ever been halted. In Japan, after battles with tens of thousands of muskets in the late 1500s, the Tokugawa rulers severely restricted the possession and sale of firearms. In the 1970s, a conference of molecular biologists at Asilomar led to a temporarily halt the development of recombinant DNA technology. Under what conditions should developments of dangerous technologies be stopped?
4. On June 22, 2009, a Metro train in Washington, D.C. crashed, and several persons were killed. The crash was caused, in part, by a faulty sensor in the automatic control system. We entrust our lives to autonomous technologies. From the household thermostat to the aircraft autopilot, these technologies have become more sophisticated: they make decisions that adapt to their environments, and their performance cannot be completely predicted beforehand. Should we continue to develop autonomous technologies that can directly affect individuals? How can we build ethical values into autonomous technologies?

Question 1:

New technologies my developed competently by having individuals who specialize in research and development conduct the development of new technologies. Although individuals may are not able to specialize in technologies which do not yet exists, individuals are able to specialize in the development of technologies is a given area. We must train individuals to conduct research. While there are many unknowns when conduction research, fundamental principle's of research still apply to any given area and individuals who are charged with the task of research and development in these area's should be very familiar with these techniques.

Question 2:

Professionals can create new technologies responsibly by thoroughly documenting all results and gradually releasing the results integrating the resulting technologies into the non-development world. For example, automated teller machines (ATMs) did not pop everywhere overnight. ATMs were progressively integrated into practical application erring on the side of caution. Many ATMs were robbed, bugs in their software existed, networking and data synchronization issues arrived and even problems still exist with the machines but because progressive and cautious integration took place, the machines have not taken down our central banking system. The exist as a function and economical part our society but one can easily imagine what may happened if the original implementation of the devices were simply integrated into every street corner over night. The buggy original machine would cause a large amount cause, inconsistencies in banking records and thieves gaining vast amounts of wealth.