**The Engineer in Society. Sample Questions Section B**

Q.1 “The harsh reality is that in the tech world, companies prefer to hire young, inexperienced, engineers.” *Vivek Wadhwa 2010*

(a) What are the career implications of the above statement for a graduate software engineer? 10 marks

(b) Discuss the ways in which the concepts of lifelong learning and CPD can contribute to the career of a software engineer. 10 marks

**[20/60 Marks]**

*Q1 (a) This question is based on issues discussed on the course. The pace of change in the software industry means that specific technical skills such as a particular programming language or operating environment can quickly become obsolete. Fresh young graduates are also cheaper to hire than experienced engineers, and just as useful…. Maybe. This is a multifaceted issue. Young graduates may have more “energy” or less clutter in their lives. However experienced engineers bring years of experience. Experience of what has worked or not worked in the past is a valuable asset, regardless of changes in the environment. It might be suggested that Zuckerberg’s recent appearance in front of the US senate committee is evidence of the naïve enthusiasm of youth which has been the driving force behind Facebook. Sometimes the experience of “older” engineers is interpreted as resistance to change. The human condition causes us to become “set in our ways” as we age. This has long been perceived as an issue for maturing organisations.*

*Whatever the rights and wrongs of the situation, the implications are that engineers must either (1) try to stay ahead of the curve or (2) migrate into a management role, or (3) find a new career path. 10 marks*

*(b) LLL is more significant in the rapidly evolving software engineering industry than just about any other sector. LLL is defined as the "lifelong, voluntary, and self-motivated pursuit of knowledge for either personal or professional reasons. As such, LLL will support all three of the solutions to the situation. It can support the transition from software engineer to antiques dealer or organic vegetable grower just as effectively as the transition from C++ programmer to Ruby on Rails expert.*

*Continuing professional development (CPD) is the means by which people maintain their knowledge and skills related to their professional lives. As such, CPD can be conceived as a subset of LLL. It is usually facilitated by the professional bodies and employers. The most significant aspect of CPD is that the responsibility lies squarely with the individual. Well meaning employers will facilitate (and usually fund) the development of new skillsets in experienced employees, but it is ultimately up to the individual to take charge of his/her own career development. 10marks*

Q.2 Yolanda is a new hire in a product design team for a software company that is developing new and more powerful versions of the kind of packet-sniffing and email scanning software systems used by law enforcement agencies and large corporations to monitor data traffic for illegal activities. This kind of software might, for example, be programmed to detect illegal downloads of copyrighted materials, or to flag for review, email keywords like ‘bomb,’ ‘steal,’ or ‘bribe.’ She is a parent of two small children, with parents and friends who are deeply proud of her achievements. She is looking forward to using this first job to cultivate a reputation in the industry for being an excellent software engineer.

One day, she happens to overhear her supervisor chatting with another supervisor about a new contract the company has recently received from a foreign government. She happens to recognize the name of this country as one that is currently run by an oppressive military regime that routinely imprisons its citizens without trial or other due process. The United Nations has strongly criticized this country’s human rights record, and many international organizations have condemned its practices.

She realizes that the product her team is working on is part of the company’s contract with this government; and in fact, she has been assigned specifically to develop the part of the product that searches for specific keyword strings in private emails, texts, social networking messages and phone conversations. Reviewing the specs for her task, she realizes that her contribution to the product will almost certainly be used to identify conversations between private citizens of this country in which there is any specific discussion of their government or its policies, and especially those in which words like ‘reform,’ ‘injustice,’ ‘corruption, ‘due process’ or ‘human rights’ occur.

The professional engineering body of which Yolanda is a member has a code of ethics which includes the following paragraph:

“Engineers shall hold paramount the safety, health, and welfare of the public. If the engineers' judgment is overruled under circumstances that endanger life or property, they shall notify their employer or client and such other authority as may be appropriate.”

1. Who are the various stakeholders in this scenario, and what does each have at stake in Yolanda’s task? 10 marks
2. What should Yolanda do? Outline her options, select your preferred approach and justify. 10 marks

(Note; this question is not testing your personal ethics, only your knowledge and understanding of the ethical framework). **[20/60 Marks]**

*Q2 This is an issue dealt with under the Professional / Business Ethics banner. The student has discussed similar scenarios. There is no prescriptive answer. I am looking for a balanced approach, persuasive argument and an ability to think beyond the obvious.*

1. *The stakeholders are:*

*Yolanda and her family. Clearly her career success is dependent on an early win. If she sets aside the ethical concern, a successful result on this project will set her on her way.*

*Her employer and it’s shareholders. The company clearly have a background in this technology space. As stated in the case, the technology can be used for good or ill, depending on who is using it….. like most technology. The shareholders have staked their money on this company being successful.*

*Her fellow employees. Just like Yolanda herself, these technical and non-technical employees have a stake in the project and the company being a success.*

*The oppressive regimes. Clearly from their perspective, their interests are served by getting their hands on this software and using it in order to cling on to power. All regimes will use technology to cling on to power.*

*The citizens of these oppressive regimes. It is implied in the case that the citizenry of these oppressive regimes will have their privacy breached by Yolanda’s project. They will suffer torture and imprisonment if they are caught by Yolanda’s software. 10 marks*

*(b) The list of options, are as follows: This is not an exhaustive list.*

*1. Get on with it. She’s not the one doing the torturing. Her product can be used for good or ill, like most products. If one follows her logic, then no one would design or manufacture guns. Besides it’s good for her career to be compliant. It may damage her future prospects if she is seen as an awkward employee.*

*2. If she is not happy to proceed, then she should raise her concerns with her supervisor. Her professional code of ethics is probably his/her supervisor’s professional code of ethics. The supervisor may not have considered the ethical implications, and may thank her for elevating her concerns.*

*3. If her supervisor does not share her concern, then she may choose to elevate beyond her supervisor. The same process applies here. Either she will be thanked for sharing her concerns or she will be instructed to get on with it. Either way she has ruptured her relationship with her supervisor.*

*4. At this point, if the task is repugnant to her, she may leave the company. This may have serious career implications.*

*5. She may become a whistleblower, either from within or outside the organisation. This requires huge energy and commitment, as well as a preparedness to be shunned, threatened or intimidated by her co-workers.*

*The student is required to outline these options, along with the implications and then to select a preferred approach and justify. 10 marks*

Q3 “The half-life of an engineer, software or hardware, is only a few years.” *Craig Barrett,(ex-President and co-founder, Intel)*

(a) What are the career implications of the above statement for a graduate software engineer. 10 marks

(b) Discuss the ways in which the concepts of lifelong learning and CPD can contribute to the career of a software engineer. 10 marks

**[20/60 Marks]**

Q.4

You are a computer programmer working for a small business that provides specialized

financial services to local, mostly small businesses. You have been working for company X

for about six months. Recently X has been occupied with reengineering the inventory

system of a local hardware chain, ABC Hardware.

Your supervisor calls you into his office. “Do you know of any existing software products to help ABC keep better track of its inventory?” You mention a particular product that you have worked with in another job and point out that ABC could use it without any modification. The only drawback, you point out, is that this software is somewhat expensive. Your supervisor leans back in his chair, “That’s no problem. We have that software. Why don’t you just install it on ABC’s computers?”

You diplomatically indicate that this would violate the licensing agreement X has with the developers of the software. “Do it anyway,” your supervisor says. “Nobody’s going to find out, and ABC is a very important client. We need to do all we can to keep them happy.”

The professional engineering body of which both you and your supervisor are members has a code of ethics which includes the following paragraph:

“Violation of copyrights, patents, trade secrets and the terms of license agreements is prohibited by law in most circumstances. Even when software is not so protected, such violations are contrary to professional behaviour. Copies of software should be made only with proper authorization. Unauthorized duplication of materials must not be condoned.”

Adapted from "The Case of the Troubled Computer Programmer" Online Ethics Center for Engineering 2/14/2010 National Academy of Engineering Accessed: Monday, February 04, 2013 [www.onlineethics.org/Resources/Cases/TroubledProgrammer.aspx](http://www.onlineethics.org/Resources/Cases/TroubledProgrammer.aspx)

What should you do? Outline your options, select your preferred approach and justify.

(Note; this question is not testing your personal ethics, only your knowledge and understanding of the ethical framework). 20 marks

**[20/60 Marks]**

Q4. This is an issue dealt with under the “Engineering Ethics banner. The student has been provided with a range of material related to this case. There is no prescriptive answer. I am looking for a balanced approach, persuasive argument and an ability to think beyond the obvious.

Professional ethics are standards of right conduct laid down by professional bodies, Medical council, IEEE etc. These standards are intended to guide the professional in his/her work and in most cases, gross violation of ethical standards will result in sanctions such as censure or withdrawal of membership.

The list of options which came with the case, are as follows:

1. Go ahead and install the software on ABC’s computers. After all, your supervisor is right: nobody will know what you have done. Furthermore, you haven’t been working for this company very long and don’t want to be branded a troublemaker.
2. Refuse to do it. Make it clear to your supervisor that he is putting you in a very difficult position, and you are not happy about it. It is illegal, and you don’t have to do it. Period.
3. Go ahead and install the software. But be sure to cover yourself first by writing a memo that clearly states that this is illegal, and you are doing it because your supervisor has left you no choice. Establish the case that your supervisor is responsible for the act, and then send several people within the company copies of this memo, including your supervisor.
4. Discuss the matter confidentially and informally with another colleague, preferably another supervisor, possibly someone over your supervisor’s head. If this person’s reaction is good, then both of you can approach your supervisor and try to talk him out of this course of action. Also, have some concrete alternatives in mind that you can propose, such as using a less expensive program, getting the license for ABC and having X absorb part of the cost, or negotiating a deal with the owner of the program to extend the license to several users at a lower rate.

Given that I have added the curveball of the code of professional ethics, I expect this to be brought into the frame at some point.

It is crucial that the student commit themselves to a particular course of action, and justify their approach.

20 marks