IEG 201 Engineering Systems

Time: 90minutes ***Total Marks: 45***

Note: All questions are compulsory. Make Suitable assumptions and state it clearly when answering. Part 1 carries 5marks each and Part 2 carries 10marks each

Part I.

1. Conceptually describe what one means by a System, a Product and a Tool. Give an example each that helps enumerate it. Identify an example of a system that can be thought of falling into all the three above categories and Support your answer of why you think so.
2. In the recent past, people who own cars are moving to self driving instead of employing a driver to drive the car. The former more so, with the advent of automatic gear transmission (AT) in cars instead of manual gear transmission (MT). Discuss who are all the stakeholders in the MT and AT scenarios of Car usage. Discuss how does the change to AT affect these respective stakeholders?
3. "In a large system, having the appropriate type of interfaces between various sub-systems is important for effective functioning of the system or systems." Using an appropriate example or examples, illustrate how the different system objectives are achieved through such different types of interfaces.
4. Define systems, sub-systems, assembly, sub-assembly and part. You can take an example to illustrate.
5. Imagine that you are a system architect and tasked with developing a mobile phone (smart phone, basic ones) based voting system for the country (India's) elections. *(Please note: You can consider either an internet based communication stack or a simple sms only enabled device).*
   a) First list the technical challenges.
   b) Next list the engineering/deployment challenges from the socio-political perspective (hint: consider the diversity in Indian population)
   c) Lastly reason out the advantage of such a system.

Part II. Answer **any two** of the following

6. For the above mobile phone-based voting system, derive the following architecture process:
   a) Define the physical architecture (system product as made up of subsystems and components).
   b) Define some functional specification (examples: external interfaces, administrative etc.,)
   c) Now, draw a systems architecture view (connect the physical to the functional and then to the external factors important for the working of the system).
   (Hint: To represent the above, use context diagrams, entity relationship to show functional flow).
7. In a large metropolis like Hyderabad or Delhi, Public Mass Transport Systems like Public buses, metros etc can help improve Air pollution considerably.
   a. List the measures of the System
   b. Which of the above measures will you use as measures of the system to advocate such a shift to public transport from private (or personal) transport options.

c. Will these measures change when it is applied for smaller towns (Tier-II cities) in the country? If so, explain.

8. Design an Internet-of-Things for management of irrigation (hint: recall the device developed by the farmer in the village – for water motor control), based on the architecture model discussed in the class (Mr Maruti). Mark all the critical interfaces for data transfer and also add a few lines on the importance of an IoT system in the context of irrigation/agriculture.