MAIN ANSWERS:

Question 1:

Yes there are smart grids(SG's) deployed in India.The "National Smart Grid Mission" under the approval of Indian Ministry of Power has allocated 14 smart grid pilot projects in India.All these projects are implemented by state-owned distribution utilities. They are Punjab, Himachal Pradesh, Haryana, Assam, Tripura, Rajasthan, IIT Kanpur(small community level), Chhattisgarh, West bengal, Maharashtra, Telangana, Karnataka, Puducherry, Gujarat, Kerala.

Generally smart grids are deployed in areas like building structures, plant and outdoor facilities where we can effectively control the power consumption on a larger scale(i.e meeting upto the daily requirement level collected from demand of customers or consumers).These are also deployed in areas like sudden increase in demand is possible usually over a large community.

Question 2:

The microgrid system is a small power supply system that is operated in parallel with a utility grid or small independent power supply system that consists of loads and distributed energy resources(usually renewable energy resources).
A microgrid is a subset of the grid that usually runs as part of the main grid, but can be isolated or "islanded" to run without the support of the main grid for a significant length of time by internally balancing electric generation within the grid.
A microgrid is a great example of smart grid technology, which helps for enhancing profit in the information technology industry .

A smart grid is a modernized electrical grid that uses information and communications technology to gather and act on information, such as information about the behaviors of suppliers and consumers, in an automated fashion to improve the efficiency, reliability, economics, and sustainability of the production and distribution of electricity. Transmission and operations: wide-area monitoring, control and protection.

Yes, microgrids can also be a smart grid if it is more advantageous than a traditional grid system even in small community areas.

Question 3:

Flexible loads which are technically called Demand Response, helps to match the demand collectively.In brief these demands can be shifted accordingly to user needs and requirement of power balance(supply or generation).Flexible loads concern more about customer needs and

their production capability. According to the requirements and demand these loads change accordingly.

Fixed loads are the loads which do not change according to the requirements. These are also called static loads which they run constantly throughout their working condition.

Question 4:

Yes, smart grids are economically viable for domestic consumers. One of the major advantages of using smart grids is that balancing the power consumption according to the requirement and demands of consumers it also economically benefits domestic consumers. Smart grids development also helps in reducing the loss for any damage caused in the network.

Question 5:

Smart grids can be implemented in multiple phases and through multiple models. Public-Private-Partnership(PPP or P3) is the most recommended and effective engagement model.
Both government and private work together in effective implementation of smart grid projects for a long-term tenure and completion of projects on time to provide services to the public.

The bulk power generation is done by some government entities and along with some private companies(usually use renewable energy) and effective collaboration of both is necessary in a smart grid system to meet the requirements of customers and stakeholders and also improve the economical standards of the country.
Some of the smart grid manufacturing/service private companies include ABB Global Industries, IBM,Cisco products, Infosys, Wipro etc collaborated with government of india enterprises like Power Grid Corporation of India and Central Electricity Authority.

Question 6:

Business and customer care(meeting the energy demands and requirements of customers more effectively and efficiently), smart charging of PHEV(Plug in Hybrid Electric Vehicle which runs on both fuel and electricity) and V2G(vehicle to grid technology system which helps in pushing back the energy to grid to balance the variations in energy consumption). Smart grid ensures providing quality and safe power(electricity) to consumers in a reliable way, which also balances the economic requirements.

Agriculture sector and rural areas also require power consumption broadly in crop production. Smart grids can help to increase the crop production efficiency and reducing the manpower, which also improves the economy in agricultural production

Question 7:

Conditions required for the grid to be called smart:

Reliability → Making use of technologies for the measures like state estimation, fault detection,self healing system etc without more requirement of human(technicians) which will ensure more reliable supply

Flexible Network Connectivity → Classic grids were designed for one-way flow of electricity, but if a local sub-network generates more power than it is consuming, the reverse flow can raise safety and reliability issues which is one of the major features of smart grid.This concept of reverse using of energy is called bidirectional energy flow.

Substation Automation → Refers to using data from Intelligent Electronic Devices(IED), control and automation capabilities within the substation, and control commands from remote users to control power-system devices.

Advanced Metering Reading → Technology of automatically collecting consumption and status data from water meter or energy metering devices (gas, electric) and transferring that data to a central database for billing and analyzing.

Question 8:

The present existing system is a centralized grid and making this is distributed form to make it a smart grid. Some of the IoT applications and sensor technology, which are currently existing in various other domains for development, are to be incorporated in the current grid to make it smarter. Improving software technologies like mobile applications etc which tracks daily

consumption of power and incorporating automation system in home level so that it reduces more power consumption

Question 9:

Initiatives taken by other countries outside India in deployment or direction of smart grids:

Enel :

The earliest, and one of the largest, examples of a smart grid is the Italian system installed by Enel S.p.A. of Italy. Completed in 2005.This is widely regarded as first commercial scale development in smart grid technology where the company manufactured their own meters, own system software for controlling and monitoring

U.S Department of Energy -ARRA Smart Grid Project :

One of the largest deployment programs in the world to-date is the U.S. Dept. of Energy's Smart Grid Program funded by the American Recovery and Reinvestment Act of 2009. This program consisted of Investment Grants (matching), Demonstration Projects, Consumer Acceptance Studies, and Workforce Education Programs. Reports from all individual utility programs.

Open ADR(Automated Demand Response) System :

The OpenADR standard was demonstrated in Bracknell, England, where peak use in commercial buildings was reduced by 45 percent

Question 10:

At present in India, consumers mostly get the information regarding the power consumption monthly. From the monthly bill, the consumer can just estimate how many units(kWh) of power is consumed roughly. By increasing the frequency from monthly to weekly or daily using some technology like development of Software Apps, the consumer gets an idea on average consumption so that the consumer can more preserve the power or reduce the power consumption which also helps his economic needs and requirements.