first mid-term examination

Subject → Smart Grid technology

Que ①(a): What is smart grid ? explain its need in power system?

Ans :- A smart grid is digitally enabled electrical grid that collects, distributes & works on the information about the behaviours of all suppliers & consumers in order to improve the efficiency, reliability and sustainability of electricity service.

smart grid = IT + Electric Grid

Basic need of smart grid :-

A smart grid have following seven key benefits for consumers, business utilities & the nation.

(i) **Self Healing :-**

smart grid automatically detects & response to routine problems and quickly recovers if they occur, minimizing downtime & finacial losses.

(ii) **motivates and includes the customer :-**

smart grid provides all consumers a visibility to real time pricing and the facility for families to use the electricity by setting there budget or target as per income.

(iii) **Resists Attack :-**

smart grid has security built in which resists all vulnerable activities.

(iv) provide power quality for 21st century need :-

Smart grid provides power free of sags, spikes disturbance, interruption. It is suitable for use by data centers computers, electronics robotic manufacturing to decide the future economy.

(v) Accommodates all generation & storage option :-

Smart grid provides power free of sags, spikes, disturbance interruption. It is suitable for use by data centers computers, electronics that enable "plug & play" interconnection to multiple sources of power & storage.

(vi) Enable market :-

By providing cost to cost operation smart grid supports energy markets that encourage investment & innovation

(vii) optimizes Asset and operates efficiency :-

It enables us to build less new infrastructure & to transmit more power through existing system and thereby spend less to operate & maintain the grid.

(b) What are Smart grid development & international achievement ?

Ans :- The term smart grid introduced in 1990's and the first smart grid implementation is credited to italy. Starting work in 2000 have installed More than 30 million meters across the country.

Smart grid in india :-

India is developing a smart grid policy as part of a larger nationwide energy policy. efforts underway across both the national & state governments.

→ Accommodation of load growth in a fast-growing economy.

→ A goal of extending electricity to rural area.

→ load management and loss mitigation etc.

main aim of smart grid are given below

(1.) smart Buildings

(2.) Green transport

(3.) Renewable energy

(4) Information & communication technology

(5.) Security & surveillance.

(6.) smart Grid

(7.) Energy Storage

(8) smart meters

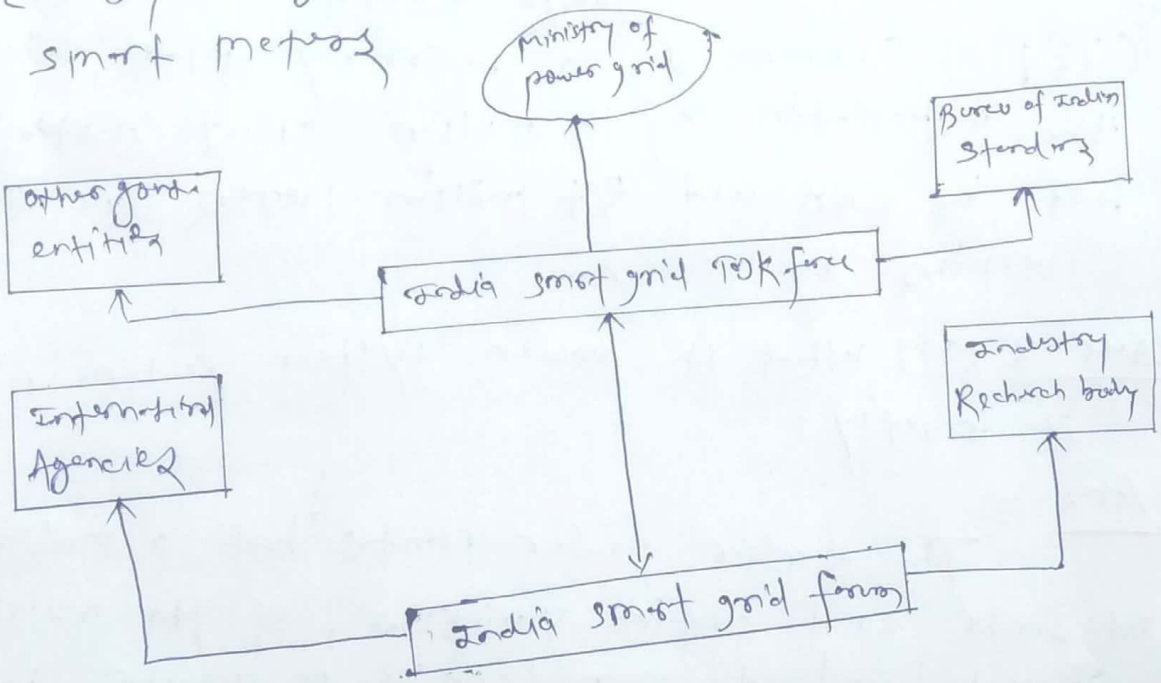

fig 1 :- Information flow and hierarchy diagram of ISGTF & the ISGF

Smart grid in China :-

As the leading player in the construc of the smart grid in china, the SGCC has played an positive role in carrying out pilot projects by mean of independent investment and public tendering. It is estimated that the SGCC will invest a total of 1 trillion chinese yuan (@ $ 200.8 billion) by 2020 across the three phases of its power grid plan.

Smart grid in Germany :-

E- Energy : The internate of energy intiative, government mandated all buildings to be equipped with smart meters from 2010 & Demand Response program from 2012. Smart Grid investment by 2020 estimated at €[illegible]08.

Smart grid in Japan :-

Tokyo Electric power Company (TEPCO) announced a recovery plan which includes the installation of 17 million smart meter in house hold by 2018 and 27 million meters for all residential customers by 2023.

Que 2 (a) : What is power system automation ? explain it briefly.

Ans :-

The earlier power plants had a modest number of sensor and action variables, of the order of several hundreds. modern large power station have in excess of hundreds of thousands, even tens of million variables.

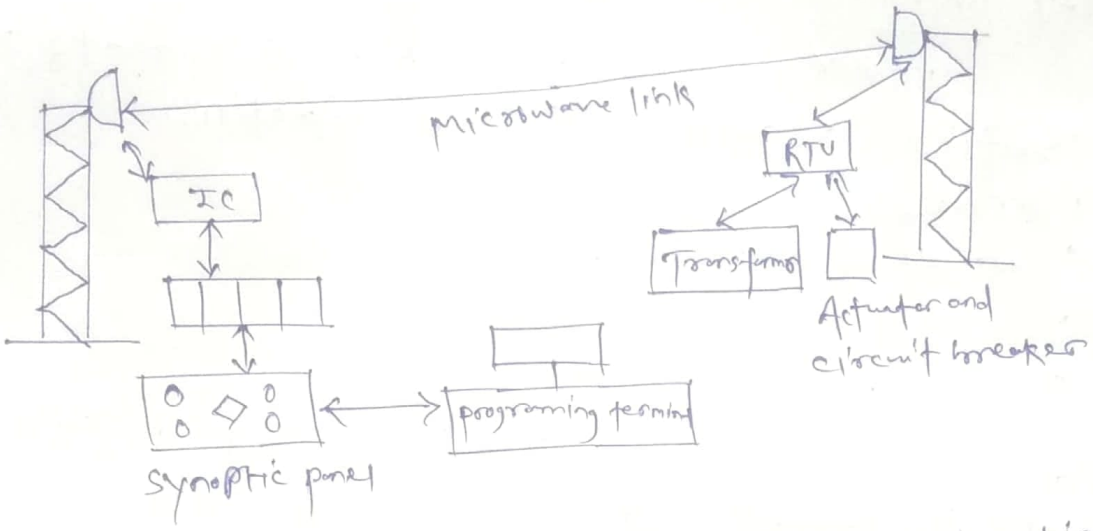

Fig :- power system automation architecture

In earlier system the "mini-computer" would have been sourced from specialised computer company such as IBM, perkin Elmer, Digital equipment corporation. The operating system would have belonged to the same equipment provider. The microwave link would have been part of the infrastructure costs for the project. The synoptic panel, allowed actual representation of the system states to the operator.

The cost of ownership was very high. Also very high were the costs of maintaining & upgrading this hardware and software. The cost of software (increasingly) often prohibitive. Communication link failure meant that there was at the time, or there is even at in this generation, a need of "manual back ups". This usually meant sending a technician to do manual switching operation.

(b) What type of components use in power System Automation?

Ans :- (1.) overview :

power system automation components may be classified according to their function.

- Sensors
- Interface equipment
- Controllers
- Actuators

Thus we see that figure is a good representation of what is needed to affect automation.

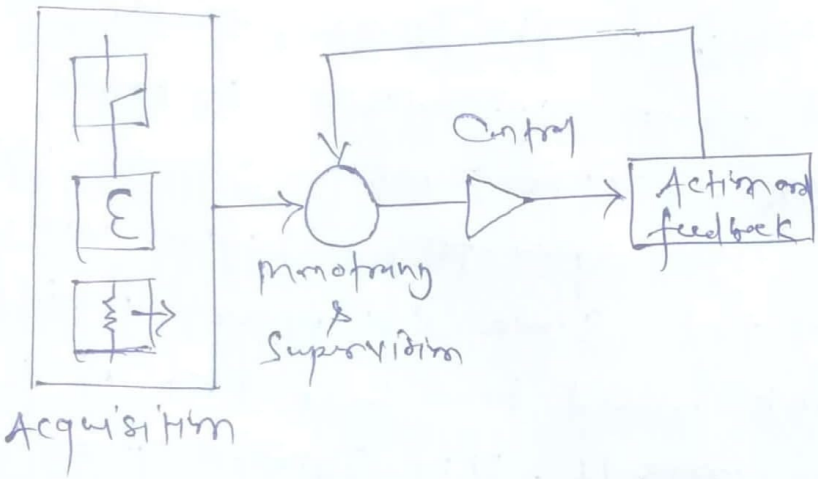

Fig :- power system automation control schemes

(2.) Sensors

(i) current & voltage Transformers

(ii) other Sensors :-

for reliable electrical power system performance the states, stress condition & the environment condition associated with the components have to be monitored.

(iii) Switches / Isolators / circuit breakers.