INDEX

UNIT I

Syllabus : Layout and working of a typical thermal power plant with steam turbines and electric generators. Properties of conventional fuels used in the energy conversion equipment used in thermal power plants : Coal, Gas/diesel, Nuclear fuels – fusion and fission action., Safe practices and working of various thermal power plants : coal-based, gas-based. diesel-based, nuclear-based., Functions of the following types of thermal power plants and their major auxiliaries : (a) Coal fired boilers : fire tube and water tube (b) Gas/diesel based combustion engines, (c) Types of nuclear reactors : Disposal of nuclear waste and nuclear shielding, Thermal power plants in Maharashtra.

UNIT II

Chapter 2 : Large and Micro Hydro Power Plants **2-1 to 2-34**

Syllabus : Energy conversion process of hydro power plant., Classification of hydro power plant : High medium and low head. Construction and working of hydro turbines used in different types of hydro power plant : (a) High head-Pelton turbine (b) Medium head-Francis turbine (c) Low head-Kaplan turbine Safe Practices for hydro power plants. Different types of micro-hydro turbines for different heads : Pelton Francis and Kaplan turbines. Locations of these different types of large and micro-hydro power plants in Maharashtra. Potential locations of micro-hydro power plants in Maharashtra.

UNIT III

Syllabus : Solar Map of India : Global solar power radiation. Solar Power Technology : (a) Concentrated Solar Power (CSP) plants. Construction and working of : Power Tower, Parabolic Trough, Parabolic Dish, Fresnel Reflectors. (b) Solar Photovoltaic (PV) power plant : layout, construction, working. **Biomass-based Power Plants :** (a) Layout of a Bio-chemical based (e.g. biogas) power plant (b) Layout of a Thermo-chemical based (e.g. Municipal waste) power plant (c) Layout of a Agro-chemical based (e.g. bio-diesel) power plant. Features of the solid, liquid and gas biomasses as fuel for biomass power plant.

UNIT IV

Syllabus : Wind Map of India : Wind power density in watts per square meter. **Layout of Horizontal axis large wind power plant :** (a) Geared wind power plant (b) Direct drive wind power plant, Salient Features of electric generators used in large wind power plants. **(a) Constant Speed Electric Generators :** Squirrel Cage induction Generators (SCIG), Wound Rotor, Induction Generator (WRIG), **(b) Variable Speed Electric Generators :** Doubly – fed induction generator (DFIG), wound rotor synchronous generator (WRSG), permanent magnet synchronous generator (PMSG), Construction layout of different types of horizontal and vertical axis small wind turbines, **Working of different types of horizontal and vertical axis small wind turbines :** direct-drive and geared; permanent magnet generators and induction generators. Location and installation of small wind turbines.

UNIT V

Syllabus : Related terms : connected load, firm power, cold reserve, hot reserve, spinning reserve. Base load and peak load plants; Load curve, load duration curve, integrated duration curve., **Cost of generation :** Average demand, maximum demand, demand factor, plant capacity factor, plant use factor, diversity factor, load factor and plant load factor. Choice of size and number of generator units, combined operation of power station. **Causes and Impact and reasons of grid system fault :** State grid, national grid, brownout and blackout; sample blackouts at national and international level.

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