

**A 1389**

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2007.

Seventh Semester

Mechanical Engineering

ME 432 — POWER PLANT ENGINEERING

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

Approved charts and tables permitted for use.

PART A — (10 × 2 = 20 marks)

1. A diesel power plant is rated 30 MWe. Indicate the probable heat rate and thermal efficiencies at full load.
2. What is an aeroderivative gas turbine power plant?
3. Indicate typical steam pressure and temperature of a 210 MWe rated coal fueled thermal power plant.
4. Indicate the constituents of a typical FBC boiler bed.
5. Indian coals are inferior to imported coals. Elaborate.
6. Indicate the types of burners employed for pulverised coals in the thermal power plants.
7. Name the major indices of performance of a power boiler.
8. Indicate the usefulness of a load curve of, say, an utility like TNEB.
9. Indicate the types of Nuclear power plants that are operational in India excluding the prototype units.
10. Indicate the two major nuclear power plant catastrophes the globe has witnessed.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Discuss the construction and working of an energy efficient modern C.I. engine power plant with an illustration. (12)
- (ii) If one such plant is rated 36 MWe, give a typical Sankey diagram of energy balance for at full load. (4)

Or

- (b) (i) Give the schematic of a Gas Turbine and Steam Turbine combined cycle power plant and discuss its features. (12)
- (ii) Give a brief note on integrated gasifier combined cycle plants using coal fuel. (4)
12. (a) (i) Give the schematic of a high pressure power boiler unit and discuss its working features. (12)
- (ii) Briefly indicate how the criticalities of water as the working fluid affect the performance of a thermal power plant. (4)

Or

- (b) (i) Depict a circulating fluidised bed boiler schematic and discuss its working. (12)
- (ii) Indicate the merits of fluidisation of the boiler charge in power plant systems. (4)
13. (a) (i) Give a note on the following pollutants of a thermal power plant and their control methodologies of  $\text{NO}_x$ ,  $\text{SO}_x$ , and  $\text{CO}_2$ . (12)
- (ii) Briefly discuss about balanced draughting in steam power plant systems. (4)

Or

- (b) (i) Discuss the organisation of a typical coal milling system for the 210 MWe thermal power plant with an illustration. (12)
- (ii) Give a brief note on dry type cooling towers for power plant applications. (4)
14. (a) (i) Outline the scheme of feed water quality control and maintenance in thermal power plants of size 220 MWe and higher with illustrations. (12)
- (ii) Indicate the major built-in safety regulations of a power plant steam generator system and briefly discuss. (4)

Or

- (b) (i) The following data pertain to a power plant :-  
 Load factor : 70% ; Capacity factor : 50% ; Use factor : 60% ;  
 Peak load 20 MW.  
 Calculate the following quantities :
- (1) Annual electricity generation
  - (2) The reserve capacity over and above the peak load
  - (3) The duration of the plant not in service. (12)
- (ii) Briefly explain about the working principle of  $\text{CO}_2$  recorders. (4)

- combined (12)  
using (4)  
discuss (12)  
fluid (4)  
its (12)  
er (4)  
nt (2)  
t  
)
5. (a) (i) Discuss the features of a boiling water nuclear fission reactor power plant with an illustration. Does India has such plants in operation? (12)
- (ii) Indicate the status of nuclear power generation in India. (4)

Or

- (b) (i) Discuss the construction and working of a typical gas cooled nuclear fission reactor power plant with an illustration indicating the merits and demerits of a gas being used as the coolant. (12)
- (ii) What is a closed nuclear fuel cycle in nuclear power generation? Briefly discuss. (4)
-