Registration No. :

Total number of printed pages – 4

1.   Answer the following questions :   2×10

(a)   What is a super thermal power plant ? Name two such plants present in the state of Odisha.

(b)   Name different routes through which energy from sun can utilized for power generation.

(c)   Fusible plug is a boiler accessory or mounting. State its function.

(d)   Name the basic thermodynamic cycle on which coal fired thermal power plant operates and represents it on a T- S diagram when steam coming out of the boiler is above critical state.

(e)   Distinguish between water tube and fire tube boiler with one example from each.

(f)   How a feed water heater works ? Why in a power plant at least one feed heater must be open type ?

(g)   What is the function of an FD fan ? Where is it located ?

(h)   Define Plant load factor. State its importance

(i)   Define reheat factor. What is its significance ?

(j)   State four nuclear power plant establishment of India with their installed capacity.

2.   (a)   Draw a general layout of a modern coal fired thermal power station and briefly explain different circuits.   6

     (b)   What are the factors considered to select the site for a coal fired thermal power station ?   4

3.   (a)   What are the functions of the draught system ? What are the methods in which draught is produced in a boiler ? Explain with a sketch what is balanced draught.   5

     (b)   What is a high pressure once through boiler ? Draw a neat sketch and explain its working procedure with salient features.   5

4.   A surface condenser receives 22 ton/h of 95 percent dry saturated steam at 40°C. The air leakage to the condenser is estimated to 0.45 kg per 1000 kg of steam. The condensate leaves at a temperature of 40°C. Makeup water is supplied at 12°C. The cooling water enters at 33°C and leaves at 40°C. A separate air extraction pump is added and from the air cooler section air along with some steam leaves at 30°C. The pressure in the condenser is assumed to be constant. Calculate   10

     (i)   The rate of saving of condensate and the rate of saving in the heat supply in the boiler due to separate air extraction pump.

(ii)   The percentage reduction in the air ejector load due to this separate air extraction method.

(iii)   The rate of cooling water flow.

5.   (a)   Why is convergent-divergent nozzle generally used in steam turbines ? How the nozzle is selected for a particular type of job ?   4

(b)   Steam with initial pressure of 12bar and 250°C is expanded in a group of convergent-divergent nozzles at the rate of 5kg/s. The back pressure is 1.5 bar. The throat area of one nozzle is estimated to be 1.05 cm^2. Design suitable number of nozzles and exit area neglecting the effect of supersaturation.   6

6.   (a)   Name different governing techniques adopted for steam turbines. Explain briefly one of the commonly used governing methods.   3

(b)   In a reaction turbine, the blade tips are inclined at 35° and 20° in the direction of motion. The guide blades are of the same shape as the moving blades, but reversed in direction. At a certain place in the turbine, the drum diameter is 1 meter and the blades are 10 cm high. At this place, the steam has pressure of 1.75 bar and dryness 0.935. If the speed of this turbine is 250 rpm and the steam passes through the blades without shock, find the mass of steam flow and power developed in the ring of moving blades.   7

7.   (a)   What is meant by Uranium enrichment ? Describe three of the methods of Uranium enrichment..   3

(b)   With a neat sketch explain the principles of a heavy water reactor.   3

(c)   Explain different components of a nuclear reactor with a neat sketch.   4

8. Write short notes on any **two** of the following : 5×2

    (a) Waste disposal in a nuclear power plant

    (b) Cooling tower types

    (c) Fluidized bed combustion

    (d) Economic load sharing.

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