

B. Tech. Sem - VIII (Mechanical Engg.) (2014 COURSE) (CBCS) :
WINTER - 2018

SUBJECT: POWER PLANT ENGINEERING

Day: Tuesday
Date: 13/11/2018

Time: 02.30 PM TO 05.30 PM
Max Marks: 60

W-2018-2651

N.B.:

- 1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10 and Q.11 or Q. 12.
- 2) Figures to the right indicate **FULL** marks
- 3) Assume suitable **DATA** if necessary.

Q.1 a) How cogeneration plant operates? **(05)**
With the help of a neat sketch, explain working of cogeneration power plant.
Give commercial example of such a plant.

b) What is the present status of power generation in India? **(05)**

OR

Q.2 a) With the help of a neat sketch, explain components of a nuclear power plant. **(05)**

b) What do you understand by Indian Electricity Grid Code (IEGC)? **(05)**

Q.3 A steam at 150 bar & 540°C enters the HP turbine. After expansion in turbine, it is reheated with pressure ratio of 0.25. Steam from LP turbine leaves to the condenser at 0.1 bar. Calculate the cycle efficiency, if reheating is done at 540°C. **(10)**
Draw T-S and H-S diagram for the process.

OR

Q.4 a) What are the different coal burning methods? **(05)**
Explain operation of any one type of mechanical stoker with the help of a neat sketch.

b) With the help of a neat sketch, explain forced and induced draught systems in a thermal power plant. **(05)**

Q.5 a) What are elements of steam condensing plant? **(05)**
What are advantages of condensers?

b) What is the function of a cooling tower? **(05)**
What are the different types of cooling towers?
Explain any one with the help of a neat sketch.

OR

Q.6 a) Derive an expression for quantity of cooling water to be circulated through a condenser per kg of steam condensed? **(05)**

b) What is the effect of friction on performance of a nozzle? **(05)**
Also explain the term the nozzle efficiency.

P.T.O.

Q.7 a) What are the testing methods available in IS code for solar flat plate collectors? (05)
Explain 'Thermal Efficiency Test' on a solar flat plate collector.

b) What are the different design considerations for a wind turbine? (05)

OR

Q.8 a) What are first, second and third generation bio-fuels? (05)

b) What are the different methods of conversion of biomass into energy? (05)
Explain any one method with the help of a neat sketch.

Q.9 a) What do you understand by base load and peak load plants? (05)
How these plants satisfy energy needs of different consumers?

b) What are the various costs associated with generation of electrical energy? (05)

OR

Q.10 To serve the load having the annual duration characteristics given in the following table: (10)

Load in kW	5000	4000	2000	1000	500
No. of hrs. at load	200	4000	2000	1000	1560

Two plants, a steam power plant and diesel plant, are being considered. The coal of 28,000 kJ/kg calorific value is available at Rs. 350/- per tonne and diesel oil of 36,000 kJ/kg calorific value is available at Rs. 1,200/- per tonne. The performance characteristics of the plants are given below:

$$\text{Steam: } I = 5 \times 10^6 (1.5 + 2L + 0.025L^3) \text{ kJ/hr.}$$

$$\text{Diesel: } I = 5 \times 10^6 (2.25 + L + 0.012L^2 - 0.004L^3) \text{ kJ/hr.}$$

Where L is in MW and I is in kJ/hr.

The extra salary for steam power plant compared to diesel plant is Rs. 3,20,000/- as number of operators required is more.

The capital investment cost for steam plant is Rs. 18,500/- per kW and for the diesel plant is Rs. 17,000/- per kW. The fixed charge rate is 12% for each plant.

Which plant should be selected for the required duty?

Q.11 a) Enlist different energy storage technologies available. With the help of a neat sketch, explain working of any one energy storage technology. State its advantages and limitations. (05)

b) What are the safety measures to be taken during operation of a thermal power plant? (05)

OR

Q.12 a) Explain the various technological advancements occurred in battery storage? (05)

b) What are the different types of tests conducted before commissioning of a thermal power plant? (05)