

GUJARAT TECHNOLOGICAL UNIVERSITY

B. E. Sem. - V - Examination – June- 2011

Subject code: 151904**Subject Name: Power Plant Engineering****Date: 27/06/2011****Time: 10:30 am – 01:00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

Q.1 (a) The following observations were made during a test on surface condenser. **07**

Barometer reading = 760 mm of Hg, condenser vacuum = 705 mm of Hg,
Mean temperature of condensate = 35°C, Condensate collected = 2000 kg/h,
Quantity of cooling water circulated = 60,000 kg/h, Rise in temperature of
cooling water = 16°C, Hot well temperature = 28°C.

Determine;

(i) Vacuum efficiency (ii) Condenser efficiency (iii) Quality of steam
entering the condenser and (iv) Mass of air present per m³ of condenser
volume.

Assume inlet temperature of water as 20°C.

(b) (i) Explain the principle of working of a electrostatic precipitator with the **04**
help of a neat diagram.

(ii) Explain : Priming and Foaming **03**

Q.2 (a) Draw a neat line diagram of a Benson boiler. State the main difficulty **07**
experienced in the La Mont boiler and how it is prevented. Explain its
advantages.

(b) Draw a neat named general layout of modern thermal power plant. Explain **07**
four main circuits. Name factors to be considered for selection of site for
thermal power station.

OR

(b) (i) Convection and radiant super heaters have opposite characteristics of **04**
temperatures v/s load- Explain.

(ii) Why super heat temperature needs to be controlled? **03**
Explain attemperation method.

Q.3 (a) Derive an expression for chimney height in order to obtain a draught of 'h' **07**
mm of water column if the boiler used 'm' kg of air / kg of fuel. Assume,
surrounding air temperature as 'T₁' and flue gas temperature as 'T₂' in
degree absolute.

Also derive an expression for the condition of maximum discharge of
flue gases through a chimney.

(b) (i) State requirements of a good fuel injection system. Explain working **05**
with a schematic of a common- Rail system.

(ii) Explain necessity of cooling IC engines **02**

OR

Q.3 (a) A boiler uses 1000 kg of coal/ h. The temperature of hot gases inside the **07**
chimney is 650 K and the outside air temperature is 300 K. The draught
produced by the chimney of 25 m height is 15 mm of water.

Determine the air supplied per kg of fuel burnt , draught in terms of hot

gases, mass flow rate of hot gases and area of the chimney required if the co-efficient of velocity is 0.4

- (b) State objectives of a lubrication system. Explain working with a schematic of a dry sump lubrication system. Differentiate between wet sump and dry sump lubrication system. **07**

- Q.4 (a)** (i) Describe CANDU type reactor with the help of a neat sketch. State its advantages and disadvantages. **04**

- (ii) State the functions of a moderator and control rods. **03**

- (b) Define the following terms: **07**
Connected load, Maximum demand, Average demand, Load factor, Diversity factor, utilization factor, Plant capacity factor.

OR

- Q.4 (a)** (i) Describe PWR power plant with a schematic. Explain the functions of a pressuriser **04**

- (ii) Describe BWR power plant with a schematic. **03**

- (b) An industrial power station has a maximum demand of 70 MW and installed capacity is a single generator of 50 MW. Excess energy if required is brought from the state grid. The load curve of the plant is defined as follows: **07**

Time(Hrs)	0-6	6-8	8-12	12-14	14-18	18-22	22-24
Load (MW)	30	46	60	46	66	70	36

Determine

- (i) Load factor of power station
(ii) Load factor of generator station
(iii) Energy purchased from grid/ day
(iv) Plant use factor

- Q.5 (a)** Discuss causes and harmful effects of pollutants on environment. **07**

- (b) (i) Discuss the principle of operation of overfeed and underfeed stokers with the help of simple diagrams. **05**

- (ii) State important advantages of pulverized coal system. **02**

OR

- Q.5 (a)** (i) Define ion exchange process. What are cation and anion resins. Discuss the principle of ion exchange process and its utility in demineralization of water with a neat sketch. How resins can be regenerated ? **07**

- (b) (i) Write short note on: Reverse osmosis and its application on sea water treatment. **05**

- (ii) Write short note on: Once through cooling system. **02**
