

GUJARAT TECHNOLOGICAL UNIVERSITY**BE SEM-V Examination-Nov/Dec.-2011****Subject code: 151904****Date: 29/11/2011****Subject Name: Power Plant Engineering****Time: 2.30 pm -5.00 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) Draw a steam power plant and discuss its advantages. **07**
(b) (i) What is the function of stokers? Compare underfeed and overfeed stokers. **03**
(ii) Enumerate different types of ash handling systems. **04**
Discuss the working of pneumatic ash handling system.

- Q.2** (a) Explain the working of pressurized fluidized bed combustion boiler with help of neat sketch. **07**
(b) (i) Distinguish between superheater, reheater and air preheater. **03**
(ii) What is subcritical and supercritical boiler? **02**
(iii) Write different methods of controlling temperature of super heated steam. **02**

OR

- (b) What are the reasons of corrosion in a boiler and how it is control? **07**

- Q.3** (a) (i) What is pH value of water? What is its important in boiler feed water? **03**
(ii) Explain sea water treatment plant. **04**
(b) Draw and explain diesel engine power plant. **07**

OR

- Q.3** (a) (i) What are the different impurities in feed water and write their effect on boiler. **03**
(ii) With help of neat sketch explain Zeolite feed water treatment process. **04**
(b) Differentiate Between : **07**
(i) Wet sump lubricating system and Dry sump lubricating system.
(ii) Diesel power plant and steam power plant.
(iii) Water cooling system and air cooling system.

- Q.4** (a) Explain the followings : **07**
(i) Binding energy
(ii) Mass defect
(iii) Moderators
(iv) Control rod
(v) Isotopes
(vi) Nuclear fission
(vii) Nuclear fusion
(b) What are the different pollutant emitted from power plant and discuss its defects. **07**

OR

- Q.4 (a)** With help of neat sketch explain advantages and disadvantages of boiling water reactor nuclear power plant. **07**
- (b)** Define the following : **07**
- (i) Connected load
 - (ii) Maximum demand
 - (iii) Average demand
 - (iv) Load factor
 - (v) Diversity factor
 - (vi) utilization factor
 - (vii) Plant capacity factor

- Q.5 (a)** A 100 MW thermal power has peak load of 65 MW. The power station supplies load to four town having their maximum demand of 20 MW, 15 MW, 10 MW and 30MW. The annual load factor is 65%. Find : **07**
- (i) Average load on the plant.
 - (ii) Energy supplied per year.
 - (iii) Diversity factor.
 - (iv) Demand factor.
 - (v) Plant capacity factor.
- (b) (i)** Why cooling towers used in a thermal power plant? Discuss the working of a natural cooling tower. **04**
- (ii)** Why is draught necessary in a boiler? Compare the natural draught and artificial draught. **03**

OR

- Q.5 (a) (i)** Determine height of the chimney to produce a static draught of 17 mm of water. The temperature in the chimney is 300°C and surrounding temperature is 28°C. The barometer reads 755 mm of Hg. The value of characteristic gas constant is 287 J/kgK and that for gases is 255 J/kgK **04**
- (ii)** Write disadvantages of steam, diesel and nuclear power plant. **03**
- (b)** A steam turbine of 20,000 kW capacity requires 5 kg of steam per hour per kW. The quantity of air leakage into the condenser is 1 kg per 1000 kg of steam used by turbine. The vacuum in the condenser is 70 cm of Hg when the barometer reads 76 cm of Hg. The temperature at the suction of the air pump is 30°C. The surface condenser used is fitted with a separate condensate pump and air pump. Find : **07**
- a) The capacity of the air pump requires per minute.
 - b) The mass of water vapor carried by air in kg/hr.
 - c) The quantity of cooling water required per minute in tons if the rise in temperature of water is limited to 8°C. The quantity of steam entering the condenser is 0.9 dry and there is no under cooling in the condenser.
- Properties of steam at 30°C :
- | | |
|----------------------------------|---------------------------|
| Absolute Pressure | = 0.04325 bar |
| Enthalpy of liquid h_f | = 125.8 kJ/kg |
| Enthalpy of evaporation h_{fg} | = 2438.1 kJ/kg |
| Specific volume | = 32.8 m ³ /kg |
