

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER-V EXAMINATION – WINTER 2015

Subject Code: 151906**Date: 14/12/2015****Subject Name: Conventional Power Engineering****Time: 10:30am to 1:00pm****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) On which cycle thermal power plant works? Explain the cycle with line diagram. Also plot (T-s) and (h-s) diagram. **07**

(b) In a Rankine cycle, the steam at inlet to turbine is saturated at a pressure of 35 bar and the exhaust pressure is 0.2 bar. Assume flow rate of 9.5 kg/s. Determine : **07**
(i) The pump work, (ii) The turbine work, (iii) The Rankine efficiency, (iv) The condenser heat flow, (v) The dryness at the end of expansion, (vi) Represent the same cycle on T-s diagram.

From steam table :

At 35 bar : $h_{g1} = 2802 \text{ kJ/kg}$, $sg_1 = 6.1228 \text{ kJ/kg K}$

At 0.2 bar : $h_f = 251.5 \text{ kJ/kg}$, $h_{fg} = 2358.4 \text{ kJ/kg}$, $v_f = 0.001017 \text{ m}^3/\text{kg}$,
 $s_f = 0.8321 \text{ kJ/kg K}$, $s_{fg} = 7.0773 \text{ kJ/kg K}$.

Q.2 (a) In a gas turbine plant working on Brayton cycle, the air at inlet is 27°C, 0.1 MPa. The pressure ratio is 6.25 and the maximum temperature is 800°C. The turbine and compressor efficiencies are each 80%. Find compressor work, turbine work, heat supplied, cycle efficiency and turbine exhaust temperature. Mass of air may be considered as 1 kg. Draw T-s diagram. Assume $C_{p_{\text{air}}} = C_{p_{\text{gas}}} = 1 \text{ kJ/kg K}$. **07**

(b) Describe working of diesel power plant with suitable diagram. Write merits and demerits of diesel power plant over other types. **07**

OR

(b) Explain the following systems for diesel power plant with a neat sketch : **07**
(i) Air intake system and (ii) Engine exhaust system.

Q.3 (a) Why is compounding required in steam turbine? Explain with neat sketch any one method of compounding in steam turbine. **07**

(b) Explain the ideal and actual Brayton cycles with T-S diagrams. Derive expressions for air standard efficiency for ideal Brayton cycle. **07**

OR

Q.3 (a) State the various methods of governing of a steam turbine and Explain any one of them in detail. **07**

(b) State the various methods of improving the efficiency and work output of a gas turbine plant. With schematic and T-S diagram explain the regeneration process. **07**

Q.4 (a) What are the criteria for selection of sites for hydro electric power plant? Differentiate between Impulse and reaction water turbines. **07**

(b) What is the difference between fission and fusion process? Explain Nuclear fission chain reaction. **07**

OR

- Q.4 (a)** Define the followings; (1) Load factor, (2) utility factor, (3) plant operating factor, (4) capacity factor, (5) Demand factor, (6) Base load, (7) peak load. **07**
- (b)** Write a note on nuclear waste and its disposal. **07**
- Q.5 (a)** What are the principal parts of a nuclear reactor? Explain in brief. **07**
- (b)** Classify all hydraulic turbines and briefly explain Pelton wheel with neat diagram. **07**
- OR**
- Q.5 (a)** Describe CANDU type reactor with neat sketch and give its advantage and disadvantages over the other type of nuclear reactor. **07**
- (b)** What are the advantages and limitation of hydro power plant over other power plant? **07**
