

GUJARAT TECHNOLOGICAL UNIVERSITY**BE- Vth SEMESTER-EXAMINATION – MAY/JUNE - 2012****Subject code: 151906****Date: 07/06/2012****Subject Name: Conventional Power Engineering****Time: 02:30 pm – 05:00 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) Which are the different methods to improve the performance of Gas Turbine? Explain each with effects on Gas Turbine performance. **07**
- (b) On which cycle thermal power plant works? Explain the cycle with line diagram. Also plot (T-s) and (h-s) diagram. **07**

- Q.2** (a) In an open gas turbine plant, the pressure ratio through which air at 15 °C is compressed is 14. The same air is then heated to a maximum permissible temperature of 1300 °C first in a heat exchanger which is 75% efficient, and then in the combustion chamber. The air at 1300 °C is expanded in two stages such that the expansion work is the maximum. The air is heated to 1300 °C after the high pressure stage. Determine the cycle thermal efficiency, the work ratio and the net shaft work per kg of air. The isentropic efficiencies may be assumed to be 85% and 86% for compressor and turbine respectively. Calculate the flow rate of air for an output of 240 MW. Assume Mechanical and Generator efficiency 90%. **07**
- (b) The velocity of steam entering a simple impulse turbine is 1000 m/s, and nozzle angle is 21°. Mean peripheral velocity of blade is 400 m/s and blades are symmetrical. If the steam is to enter the blades without shock, what will be the blade angles? **07**
- (a) Neglecting the friction effects on the blades, calculate the tangential force on the blades and the diagram power for a mass flow of 0.75 kg/s. Estimate also the axial thrust and diagram efficiency.
- (b) If the relative velocity at exit is reduced by friction to 80% of that at inlet, estimate the axial thrust, diagram power and diagram efficiency

OR

- (b) Derive the equation of maximum blade efficiency for single stage Impulse turbine. And hence derive the equation for maximum power output per kg of steam. **07**
- Q.3** (a) Why governing is necessary in steam turbine? Explain any one governing method with neat sketch with its effect on performance and or efficiency of plant (If any). **07**

- (b) (I) Define following terms: **04**
Load factor, Plant capacity factor, Plant use factor, Demand factor.
(II) A power station supplies the following loads to the consumers: **03**

Time in Hr	0-6	6-10	10-12	12-16	16-20	20-22	22-24
Load in MW	30	70	90	60	100	80	60

Draw the load curve and estimate the load factor of the plant.

OR

- Q.3** (a) Why compounding is necessary in impulse turbine? Explain pressure – velocity compounding with pressure velocity diagram. **07**
(b) What is the present status of power generation in India? **07**
Explain the difference in working of three different types of Hydro turbines?
- Q.4** (a) State the advantages and disadvantages of Hydroelectric power plants. **07**
(b) A Francis turbine operates under the following condition: Outer diameter of runner = 2 m, inner diameter of runner = 1 m, head = 200 m, specific speed = 130, power developed = 20 MW. The inclination of water jet with tangential direction = 12° . The water leaves the blades radially with no velocity of whirl. Hydraulic efficiency = 92%. Calculate inlet and outlet blade angles. **07**

OR

- Q.4** (a) Explain thermosiphon cooling system with neat sketch and state its merits and demerits. **07**
(b) Draw the schematic diagram of a diesel electric power plant and explain the functions of its different components. **07**
- Q.5** (a) With neat sketch explain the principal components of Nuclear reactor **07**
(b) Explain boiling Water Reactor (BWR) with its advantages and disadvantages. **07**

OR

- Q.5** (a) What is the difference between fission and fusion process? Explain Nuclear fission chain reaction. **07**
(b) Explain Pressurized Water Reactor (PWR) with its advantages and disadvantages. **07**
