Seat No.: _____   Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–V • EXAMINATION – SUMMER • 2014

Subject Code: 151906   **Date: 24-06-2014**

Subject Name: Conventional Power Engineering

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)** Draw a general layout of a modern thermal power plant and explain the different circuits. **07**

(b) Derive the expression for efficiency of Rankine cycle. State the methods to improve the efficiency of simple Rankine cycle. **07**

Q.2 **(a)** Derive an expression for maximum blade efficiency for a single stage impule turbine. **07**

(b) Steam with absolute velocity of 300 m/sec is supplied through a nozzle to a single stage impulse turbine. The nozzle angle is 25º and the blade speed is 100 m/sec. Find suitable moving blade angles at inlet and outlet for zero axial thrust on the blades. If the blade velocity coefficient is 0.9 and steam velocity coefficient is 0.9 and steam flow rate is 8 kg/sec, calculate the power developed. **07**

OR

(b) A Parson reaction turbine running at 400 rpm with 50 % reaction develops 78 kW per kg of steam. The exit angle is 20º and the steam velocity is 1.42 times the blade velocity. Determine :
(1) Blade velocity   (2) Blade inlet angle   (3) Maximum diagram efficiency **07**

Q.3 **(a)** Explain how regeneration improves the efficiency of a gas turbine plant. **07**

(b) A gas turbine unit has a pressure ratio of 6:1 and maximum temperature of 627 ºC. The isentropic efficiencies of the compressor and turbine are 0.82 and 0.85 respectively. Calculate the power output in kW of an electric generator geared to the turbine when the air enters the compressor at 15ºC at the rate of 18 kg/sec. Take Cp = 1.005 kJ/kg K and $\gamma = 1.4$ for the compression process and take Cp = 1.11 kJ/kg K and $\gamma = 1.33$ for the expansion process. **07**

OR

Q.3 **(a)** Explain the following systems for diesel power plant with a neat sketch :
(i)   Air intake system and   (ii) Engine exhaust system. **07**

(b) State the functions of fuel injection system. With a neat sketch explain common rail injection system of a diesel power plant. **07**

Q.4 **(a)** Explain construction and working of Pelton wheel. **07**

(b) Explain the phenomenon of cavitation in hydraulic turbines. State its effects and how it can be minimized? **07**

OR

Q.4 **(a)** Write a note on fast breeder reactor. **07**

(b) Explain about various nuclear plants in India. **07**

Q.5 **(a)** Write a note on combined steam and gas turbine plant. **07**

(b) For a 50 MW power station the peak load is 30 MW. The power station supplies loads to three industrial units having their maximum demands of 12 MW, 10 MW and 14 MW. The annual load factor is 60 %. Find the average load on the plant, the energy supplied per year, diversity factor, demand factor and plant capacity factor. **07**

OR

Q.5 **(a)** Explain the various methods of tariff for calculating energy rates. **07**

(b) Write a note on nuclear waste and its disposal. **07**

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