

GUJARAT TECHNOLOGICAL UNIVERSITY**B.E. Sem-Vth Examination December 2010****Subject code: 151906****Subject Name: Conventional Power Engineering****Date: 21 /12 /2010****Time: 03.00 pm - 05.30 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Use of steam table is permissible

- Q.1**
- (a) Describe Rankine cycle with the help of schematic, (T-S) and (h-s) diagrams and derive the expression for its efficiency **07**
- (b) A steam power plant working on Rankine cycle has range of operation from 40 bar dry saturated to 0.05 bar. **07**
Determine,
(i) Cycle efficiency
(ii) Work ratio
(iii) Specific steam consumption

- Q.2**
- (a) Define blade efficiency and hence derive an expression for maximum blade efficiency for a single stage impulse steam turbine. **07**
- (b) What do you understand by compounding of steam turbine? State the different methods of compounding of steam turbine and Explain with neat sketch velocity compounded impulse steam turbine. **07**

OR

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

- Q.3**
- (a) State the applications of gas turbine and Derive an expression for the thermal efficiency of an actual Brayton cycle. **07**
- (b) The air enters the compressor of an open cycle constant pressure gas turbine at a pressure of 1 bar and temperature of 20°C. The pressure of the air after compression is 4 bar. The isentropic efficiency of compressor and turbine are 80 % and 85 % respectively. The air fuel ratio used is 90 : 1. if the flow rate of air is 3 kg per second **07**
Find,
(i) Power developed
(ii) Thermal efficiency of the cycle
Assume, $C_p = 1 \text{ kJ/kgK}$ and $\gamma = 1.4$, for air & gas
and C.V. of fuel = 41800 kJ/kg

OR

- Q.3**
- (a) Draw the schematic diagram of a Diesel electric power plant and Explain the functions of its different components **07**
- (b) State the different methods of improving the thermal efficiency of a gas turbine and Explain any one of them in detail. **07**

- Q.4**
- (a) Explain with the help of a neat sketch the construction and working of a Pelton wheel turbine. **07**
- (b) Describe with the help of a neat sketch CANDU type nuclear reactor. **07**

OR

- Q.4** (a) Answer the following : **07**
 (i) Differentiate between nuclear fission and fusion.
 (ii) Draw the neat sketch of a typical nuclear reactor and State the functions of its main components
- (b) Describe with the help of a sketch the working of a pressure water reactor(PWR). Also state its merits and demerits **07**
-
- Q.5** (a) Answer the following : **07**
 (i) Define Load factor, Diversity factor and Plant use factor.
 (ii) Discuss the effect of variation of load factor and diversity factor on the design of a power plant.
- (b) The annual peak load on a 30MW power station is 25MW. The power station supplies load having maximum demand of 10MW, 8.5MW, 5MW and 4.5MW. The annual load factor is 0.45.
 Find,
 (i) Average load
 (ii) Energy supplied per year
 (iii) Diversity factor
 (iv) Demand factor **07**
- OR**
- Q.5** (a) State the requirements of a fuel injection system in a Diesel engine and Explain with a sketch common- rail fuel injection system **07**
- (b) Discuss the methods of meeting variable loads on power plant **07**
