Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME - SEMESTER–I(New course)• EXAMINATION – WINTER- 2015

Subject Code: 2712107 **Date: 04/01/2016**

Subject Name: Thermal and Nuclear power plants

Time:2:30 pm to 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.**
4. **Use of Steam table and mollier diagram is permitted**

Q.1 (a) Explain water and steam circuit for 210 MW power plant. Give function of each component of circuit. 07

(b) Compare thermal & nuclear power plants. Name and give capacity of nuclear power plants in India. 07

Q.2 (a) Explain the concept of fluidized bed combustion. Explain recent development in it. 07

(b) Explain three stage regeneration of steam with line and T-S diagram. 07

OR

(b) Give the effects of air leakage in condenser. Give the methods for obtaining maximum vacuum in condensers. 07

Q.3 (a) Steam at pressure 15 bar and 250 ^{0}C is expanded to a pressure of 4 bar Then it is reheated to 250 ^{0}C at constant pressure and then expanded to condenser pressure 0.1 bar. Find the work done per Kg. of steam and efficiency with and without reheating. Neglect pump work. 10

(b) Explain combined steam and gas turbine plant with neat sketch. 04

OR

Q.3 (a) Derive the optimum pressure ratio for actual gas turbine cycle for maximum work output. 07

(b) Explain working of forced and induced draft cooling towers in brief. Compare them. 07

Q.4 (a) Explain with neat sketch CANDU reactor. Why it is more preferable than PWR & BWR. 07

(b) Explain method of enriching uranium and nuclear power plant safety in brief. 07

OR

Q.4 (a) In a maximum 12 MW gas turbine power plant air enters at 298K and maximum temperature in cycle is 950K. A regenerator of effectiveness 0.68 is used to recover heat from gases. Isentropic efficiency of compressor and turbine are 0.82 and 0.88. Mechanical, power generation and combustion efficiencies are 0.94, 0.94 and 0.95. Find (1) air fuel ratio (2) work ratio (3) specific fuel consumption and (4) efficiency of the plant. Take Cp air = Cp gas= 1.005 KJ/Kg K and γ gas = γ air = 1.4 C.V of fuel=41000 KJ/Kg. 10

(b) Explain future of nuclear power in India. 04

Q.5 (a) Define the factors affecting the economics of power generation. what is one unit electrical energy? 07

(b) The Peak Load on a 50 MW power station is 39 MW. It supplies power through four transformers whose connected loads are 17, 12, 9 and 10 MW. The maximum demand on these transformers are 15, 10, 8 and 9 MW. respectively. If the annual load factor is 50% and the plant is operating for 65% period of the year. Find (1) Average load (2) Unit of energy supplied per year (3) Demand factor (4) Diversity factor (5) Power station use factor. 07

OR

Q.5 (a) Explain Load and Load duration curve with suitable example. 07

(b) Explain with electrical circuit how Co2 content in the gases is measured. 07