Seat No.: _____   Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
BE – SEMESTER- VII EXAMINATION-SUMMER 2023
Subject Code: 3171910   **Date: 27/06/2023**
Subject Name: Power Plant Engineering
Time: 10:30 AM TO 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.
4. Simple and non-programmable scientific calculators are allowed.
5. Usage of steam table and Mollier chart is permitted.

			MARKS
Q.1	**(a)**	Explain the present power position of India?	**03**
	(b)	Explain the principle of fluidized bed combustion.	**04**
	(c)	Explain the working of electrostatic precipitator with neat sketch	**07**
Q.2	**(a)**	Write short note on Cyclone burner.	**03**
	(b)	Comparison between forced and induced draught.	**04**
	(c)	Derive the Condition for maximum discharge through a Nozzle or Critical pressure ratio or choked flow.	**07**
		OR	
	(c)	Derive the Condition for maximum discharge through a chimney.	**07**
Q.3	**(a)**	Explain with neat sketch pressure compounded impulse turbine.	**03**
	(b)	What are the functions of a condenser in a thermal power plant? Give the classification of condensers.	**04**
	(c)	Steam issues from the nozzles of a De Laval turbine with a velocity of 1400 m/s. The nozzle angle is $15°$, the mean blade velocity is 450 m/s and the inlet and outlet angle of blade are equal. The mass of steam flowing through turbine per hour is 1000 kg. Determine: (i) the blade angles, (ii) the relative velocity of steam entering the blades, (iii) the tangential force on the blades, (iv) the power developed, (v) the blade efficiency. Assume that K=0.8.	**07**
		OR	
Q.3	**(a)**	Give detailed comparison of impulse and reaction steam turbines.	**03**
	(b)	Explain the construction of natural draught cooling tower with diagram.	**04**
	(c)	A gas turbine unit has a pressure ratio of 6 and maximum cycle temperature is $900°$ C. The isentropic efficiencies of the compressor and turbine are 85% and 90% respectively. Air enters the compressor at $15°$ C at the rate of 5 kg/s. Calorific value of the fuel used is 43,000 kJ/kg, combustion efficiency is 95%. Using C_{pa} = 1 kJ/kg, C_{pg}= 1.07 kJ/kg K and γ = 1.4 for air and gases, find (i) thermal efficiency, (ii) power output, (iii) air-fuel ratio and (iv) specific fuel consumption.	**07**
Q.4	**(a)**	What do you understand by nuclear fusion and fission?	**03**
	(b)	The annual peak load on a 30 MW power station is 25 MW. The power station supplies load having maximum demand of 10MW, 8.5 MW, 5 MW and 4.5 MW. The annual load factor is 0.45. Find (i) Average load, (ii) energy supplied per year, (iii) diversity factor,(iv) demand factor.	**04**

(c)	Explain with neat sketch construction and working of CANDU type reactor.		**07**

OR

Q.4	**(a)**	Give the functions and materials used for following components of nuclear reactor: (i) fuel (ii) moderator (iii) reflector.	**03**
	(b)	A thermal power plant of 170 MW capacity has the maximum load of 130 MW. Its annual load factor is 0.6. The coal consumption is 1.2 kg per kwh of energy generated and the cost of coal is Rs. 850 per tonne. Calculate (i) the annual revenue earned if energy is sold at Rs. 2 per kwh and (ii) the capacity factor of the plant.	**04**
	(c)	Explain with neat sketch Boiling Water Reactor (BWR).	**07**

Q.5	**(a)**	Define: Load factor, Diversity factor, and plant use factor.	**03**
	(b)	Explain the necessity of "Feed water treatment". What are the major impurities present in feed water?	**04**
	(c)	Explain Principle, construction and working of Horizontal Axis Wind Turbine.	**07**

OR

Q.5	**(a)**	Define the following terms: (i) Peak load & (ii) Average load.	**03**
	(b)	Explain sodium zeolite feed water treatment in thermal power plants with diagram.	**04**
	(c)	Explain with neat sketch the solar furnace. What are the main advantage and disadvantages of it?	**07**

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