Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME – SEMESTER II (OLD) – • EXAMINATION – SUMMER 2016

Subject Code: 1722102 **Date:18/05/2016**

Subject Name: Thermal 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.**

Q.1 **(a)** A gas turbine power plant works on constant pressure open cycle. It consists of compressor, generator, combustion chamber and turbine (the compressor, turbine and generator mounted on the same shaft). The following data is given for this plant: **07**

The pressure and temperature of air entering into the compressor	= 1 bar, 25^0C
The pressure of air leaving the compressor	= 4 bar
Isentropic efficiency of the compressor	= 80 %
Isentropic efficiency of the turbine	= 85 %
Effectiveness of the regenerator	= 75 %
Pressure loss in regenerator along air side	= 0.08 bar
Pressure loss in regenerator along gas side	= 0.08 bar
Pressure loss in Combustion Chamber	= 0.04 bar
Combustion efficiency	= 92 %
Mechanical efficiency	= 92 %
Generator efficiency	= 92 %
Calorific value of fuel used in kJ/kg	= 40000
Flow of air	= 25.65 kg/s
Atmospheric pressure	= 1.03 bar
The maximum temperature of the cycle	= 690^0C

Determine the following:

(i) The power available at the generator terminals

(ii) The overall efficiency of the plant, and

(iii) The specific fuel consumption

Take γ = 1.4 for air and gases, C_{pa} =1 kJ/kgK ; C_{pg}= 1.1 kJ/kgK.

(b) Give the layout of modern thermal power station including major circuits/paths of flow of coal, air & flue gases, condensate & steam and cooling water. Label the major equipments. **07**

Q.2 **(a)** Explain with a sketch the characteristics of a circulating fluidized bed boiler. **07**

(b) Explain with neat sketch simple GT-ST combined plant. **07**

OR

(b) Which methods are used to improve the efficiency of a gas turbine power plant? Show them online-diagrams, p-V and T-s diagrams and explain any one. **07**

Q.3	**(a)**	Explain power plant cycle analysis.	**07**
	(b)	Briefly explain types of combustion chambers used in gas turbine plants with sketch.	**07**

OR

Q.3	**(a)**	Explain Nuclear waste and its disposal.	**07**
	(b)	Explain with neat sketch Pressurized Water Reactor. Explain function of pressurizer in PWR.	**07**
Q.4	**(a)**	With the help of a schematic diagram, explain diesel power plant and discuss its operation. What are its merits and demerits.	**07**
	(b)	Explain the main features of supercharging with the help of P-V diagram. What do you mean by turbocharging? What is the effect of intercooling in turbocharging?	**07**

OR

Q.4	**(a)**	Define: average load, peak load, load factor, use factor, capacity factor, demand factor, diversity factor.	**07**
	(b)	What are load curves? Explain effect of variable load on power plant design.	**07**
Q.5	**(a)**	How does the pumped hydro system operate? Show the main components in a neat sketch of the system.	**07**
	(b)	Explain compressed air storage plant with neat sketch	**07**

OR

Q.5	**(a)**	What is meant by tariff? Explain straight line meter rate, two part tariff and three part tariff rates.	**07**
	(b)	What is energy management? How it helps in solving problems of energy crisis?	**07**

****