Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME - SEMESTER– II (Old course)• REMEDIAL EXAMINATION – SUMMER 2015

Subject Code: 1722102 **Date:13/05/2015**

Subject Name: Thermal Power Plant Engineering

Time: 02:30 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. Assume suitable data if necessary, highlighting assumption made.

Q.1 (a) Describe methods to improve the thermal efficiency of a simple open cycle constant pressure gas turbine power plant. 07

(b) The following loads are connected to a power plant: 07

Type of load	Max. demand (MW)	Diversity factor	Demand factor
Domestic	15	1.25	0.7
Commercial	25	1.20	0.9
Industrial	50	1.30	0.98

If the overall diversity factor is 1.5 determine, (a) The maximum demand and (b) connected load of each type.

Q.2 (a) Explain performance and operating characteristics of power plants. 07

(b) Explain the supercharging in diesel engine 07

OR

(b) Write in details about Pump storage power plant. 07

Q.3 (a) State advantages of gas turbine plant over diesel and thermal power plant. 07

(b) An open cycle gas turbine plant consists of a compressor driven by high pressure turbine. A low pressure turbine produces power and exhaust gases from it go to a regenerator. Using the following data determine (a) the air flow rate in kg/sec for 2040 kW to be developed and (b) the thermal efficiency of the plant. Consider, isentropic efficiency of compressor is 86%, H.P.turbine efficiency is 85%, L.P. Turbine efficiency is 87%, Intake temperature 21^0C, Temperature at inlet to H.P.Turbine is 925 ^{0}C, Heat exchanger effectiveness is 0.75, mechanical efficiency of the compressor and H.P. turbine assembly is 99%, combustion efficiency is 98% assume air flow rate, to be equal to gas flow rate. 07

OR

(a) Which are the required properties of a good cladding material with some example. 07

(b) What is enrichment ? Explain four different methods which are used for the enrichment with neat sketch. 07

Q.4 (a) Explain with neat sketch arrangement of FBC with steam and gas turbine plants. 07

(b) Explain tubular air-preheater, Plate type air-preheater and Regenerative heat Exchangers 07

OR

(a) In a boiler trial, the following data were obtained, 07

Coal analysis dry C : 85.2%, H : 4.8%, Ash 10%

Gross C.V. of coal : 35296.4 KJ, Moisture content : 1.8%, Coal consumption 1475 kg/hr, boiler room temperature : 25^0C and feed water temperature 55^0C steam pressure is 12.36 bar, temperature 219.5^0C, steam raised 12,700 kg/hr the analysis of the dry gas by volume CO_2 = 9.4%, O_2 = 11.1%, N_2 = 79.5% the temperature of the gases in the uptake is 310^0C, mean specific heat of dry gas is 1.005 kJ/kg K Make a complete heat balance for the boiler.

(b) Explain which are the methods for energy conservation. 07

Q.5 (a) Explain with line diagram a binary vapour cycle for steam power plant and analysis for such a plant. 07

(b) What do you mean by cogeneration of power and process heat ? Explain back pressure turbine, pass out turbine. 07

OR

(a) State clearly characteristics of ideal working fluid for vapour power cycle. 07

(b) An ideal steam power plant operates between 70 bar, 550^0C and 0.075 bar. It has seven feed water heaters. Find the optimum pressure and temperature at which the heaters should operate. 07