


Name:	 UPES UNIVERSITY WITH A PURPOSE
Enrolment No:	

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2019

Course: Thermal Utilities

Program: B. Tech (ET+LLB with IPR)

Course Code: PSEG337

Instructions:

Semester: 7th

Time 03 hrs.

Max. Marks: 100

SECTION A

S. No.		Marks	CO
Q1	What is meant by wheeling?	4	CO1
Q2	Enumerate the advantages of FBC Boilers.	4	CO2
Q3	Explain the term heat-to-power ratio.	4	CO3
Q4	Name two liquid fuels, solid fuels and gaseous fuels used in boilers.	4	CO2
Q5	What are the major constituent of LPG and Natural gas?	4	CO4

SECTION B

Q6	What is the importance of draft in boilers? Explain the principle of modulating control in a boiler?	10	CO2
Q7	Explain the principles of fluidized bed combustion and pulverized fuel combustion? Discuss the various types of heat losses in a boiler?	10	CO3
Q8	Explain the operating principle of a waste heat recovery boiler with examples. Explain the operating principle of a heat pump with examples.	10	CO5
Q9	How does a shell and tube heat exchanger work? Give typical examples. How does a plate heat exchanger work? Give typical examples. Or, Explain the operating principle of a regenerator. What are heat wheels? Explain with sketch. Explain the principle of operation of a heat pipe.	10	CO1

SECTION-C

Q 10	Find out the efficiency of the boiler by direct method with the data given below: <ul style="list-style-type: none"> – Type of boiler : Coal fired – Quantity of steam (dry) generated : 8 TPH – Steam pressure (gauge) / temp : 10 kg/cm²(g)/ 180°C – Quantity of coal consumed : 1.8 TPH – Feed water temperature : 85°C 	20	CO3
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	<ul style="list-style-type: none"> - GCV of coal : 3200 kCal/kg - Enthalpy of steam at 10 kg/cm² pressure : 665 kCal/kg (saturated) - Enthalpy of feed water : 85 kCal/kg 		
Q 11	<p>Explain the operating principle of PFBC Boiler. What are the aspects to be considered in retrofitting FBC to existing boilers? Explain the term topping cycles with examples. Explain the term bottoming cycles with examples.</p> <p style="text-align: center;">Or,</p> <p>A. The measured CO₂ is 8% in an oil fired boiler flue gas. Theoretical CO₂ content for the fuel fired is 16%. Estimate the % excess air level?</p> <p>B. The following are the ultimate analysis for coal: Calculate the stoichiometric air requirement. Carbon-38%, Ash-35%, Hydrogen-5% , Sulphur-2%. For the same data, calculate the theoretical CO₂. If the actual measured CO₂ is 8%, find out the excess air levels?</p>	10+10	CO2