

Name:

Enrolment No:



UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2021

Course: Performance analysis of Thermal Equipments
Program: M. Tech –Energy Systems
Course Code: EPEC8004

Semester: III
Time 03 hrs.
Max. Marks: 100

SECTION A

- 1. Each Question will carry 5 Marks**
- 2. Instruction: Write the statement / answer(s)**

S. No.	Question	5 × 4 M= 20 M	CO
Q 1	Write down the four different type of Heat exchangers.		CO1
Q2	Find the enthalpy and entropy of dry steam at 300 °C and 70 bar.		CO1
Q3	Justify the reasons to insulate a Boiler.		CO3
Q4	List down the parameters (five) considered for running the furnaces economically.		CO3
Q5	Explain the benefits of condensate recovery system.		CO2

SECTION B

- 1. Each Question will carry 10 Marks**
- 2. Instruction: Write short / brief notes** **4 × 10 M= 40 M**

Q6	Discuss the need of performance test in boilers. Explain the indirect method for determining the <u>performance</u> of the boiler.		CO3
Q7	Explain the working of condensate recovery system using a diagram. List down its applications and advantages.		CO1
Q8	Explain the working of Fluidized bed combustion process. What are the advantages of Fluidized bed combustion over the conventional combustion process?		CO1
Q9	What do you mean by Pinch analysis? Explain Pinch analysis for a heat exchanger with a suitable example.		CO3

Section C

- 1. Each Question will carry 20 Marks**
- 2. Instruction: Write long answer.** **2 × 20 M= 40 M**

Q10	A steam turbine receives superheated steam at a pressure of 16 bar and having a degree of superheat of 109 °C. The expansion of steam takes place isentropically upto 0.07 bar. Calculate (a) Heat required to raise the temperature of dry steam from saturated temperature to superheated temperature. (b) Work done and (d) change in entropy during work done.		CO2
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Q11 4 Kg of dry steam at 6.0 bar pressure and dryness fraction of 0.5 is heated, so that it become (a) 0.95 dry (b) Dry & saturated (c) Superheated to 300 °C (d) Superheated to 250 °C. Determine the net heat supplied in each case.
Take C_{sup} for superheated steam as 2.3 kJ/ kg K.

CO2

OR

A main distribution steam pipeline of 500 m length and 150 mm diameter is not insulated and supplies steam at 15 kg/cm² to the branch pipelines. Evaluate the fuel savings if the steam pipeline would be insulated with 75 mm glass wool fiber with aluminum cladding.

Assumptions:

Boiler efficiency = 80 percent, Fuel oil cost = Rs. 700/kg, Gross calorific value of fuel oil = 12000 kCal/kg, Surface temperature without insulation (T_s) = 170 °C, Surface temperature after insulation (T_s) = 70 °C, Ambient temperature (T_a) = 30 °C.