**TU/ CODL**

**TEZPUR UNIVERSITY**

**SEMESTER END EXAMINATION (SPRING) 2019**

**DRE 202: ENERGY EFFICIENCY IN THERMAL UTILITIES**

Time: **3 Hours** Total Marks: **70**

*The figures in the right-hand margin indicate marks for the individual question.*

(*Question* ***No 1 is compulsory****. Answer* ***any six*** *questions out of the remaining questions*)

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*1. Answer the following questions in on sentence 1×10 =10

1. What is the major impurity of the coal available in India?
2. Which class of coal has the highest calorific value?
3. Where, within a boiler, feedwater is heated up to saturation temperature?
4. What is the practical limitation of cooling down exhaust flue gas of thermal power plant up to ambient temperature?
5. Name an area inside the boiler where convective mode of heat transfer dominates.
6. Name the thermodynamic cycle of the coal based thermal power plant.
7. Name two parameters affecting critical radius of insulation.
8. What are LMTD and NTU used in design and performance evaluation of heat exchanger?
9. What is the primary purpose of pulverising coal for combustion?
10. Is it true that cycle efficiency of thermal power plant remain unchanged even the temperature of condensation is changed?

2. A coal based thermal power plant is getting supply offers from two

vendors along with samples of coal and reports that claim suitability of

their coal for power generation. What are the important parameters you

expect the vendor shall report about the coal to claim it’s suitability for

the power plant? Also explain the detail test procedures to confirm the

claims of the vendors about the quality of their coal samples.

4+6=10

3. Discuss the probable reasons of the deteriorating thermal efficiency of a

boiler over a period of use. Also suggest the periodic maintenance

required to prevent deterioration of thermal performance of a boiler. How

do you justify the cost incurred in periodic maintenance? 4+3+3= 10

**P.T.O.**

4. What are the desirable characteristics of furnace? With the help of suitable

example of a typical furnace, discuss the thermal losses and their

contribution on its overall performance. 4+6=10

5. Explain the significances of waste heat recovery in thermal utilities.

Discuss the quality and quantity aspects of recoverable waste heat in

relation to its economic considerations. 4+6=10

6. Explaining the working of an industrial cogeneration system, discuss its

merits and de-merits. 10

7. How do you classify the insulation system based on the temperature of

application? List five common materials used for insulation indicating

their desirable properties. 5+5= 10

8. Solve the following:

1. Furnace oil with given composition (86% of Carbon, 12% of Hydrogen, 0.7% of Oxygen, 0.5% Nitrogen, 0.5% Sulphur, 0.35% water vapour and 0.05% ash) and gross calorific value (45 MJ/kg) is fired in a thermal utility. Estimate the air flow required for combustion of the furnace oil at the rate of 50 g/s, if 10% excess air is allowed. 6
2. State the procedure required to design a cross flow heat exchanger to preheat the air used for combustion of furnace oil mentioned in the above Question (8a). Make realistic assumptions wherever required.

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