**TU/ CODL**

**TEZPUR UNIVERSITY**

**SEMESTER END EXAMINATION (AUTUMN), 2017**

**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* ***No1 is compulsory****. Answer* ***any six*** *out of the remaining questions*

**Q1.** Answer the following questions (*one sentence is adequate for each answer*).

**1×10=10**

(a) What is the maximum amount of heat that can be generated by combustion of 1 kg coal?

(b) What are the major components of a steam power plant?

(c) What is the mode of heat transfer from the inner surface to the water in a boiler tube?

(d) What is the critical temperature?

(e) What is blowdown in a steam generator?

(f) Name two properties of steam which are used for thermal assessment of boiler?

(g) Name the thermodynamic cycle which represents the gas turbine power plant?

(h) What do you mean by the effectiveness of insulating materials?

(i) What do you mean by freezing point of liquid fuel?

(j) What is the function of a steam trap?

**Q2.** With the help of suitable example discuss the necessary conditions required for combustion of solid fuel. Do you believe that a solid fuel should possess some desirable properties to be used as a source of thermal energy? Explain. **5+5=10**

**Q3.** Mention various mountings and accessories attached to a boiler. Also state the specific functions of these mountings and accessories.

**4+6=10**

**Q4.**Why inspection and maintenance is required for boilers? With the help of suitable examples, explain the consequences of improper maintenance of boilers.

**4+6=10**

**Q5.**What is the basis of classification of coal?Do you believe ‘excess air’ is beneficial for better combustion of coal? Justify and describe your answer with the help of combustion process in a furnace.

**3+7=10**

**Q6.** Do you believe that waste heat recovery is essential in thermal utilities? Explain your answer with the help of examples of different methods of waste heat recovery. **10**

**Q7.** Explain briefly the procedure of evaluation of performance of heat exchangers.

Also explain the working of a *Shell and tube* heat exchanger.

**5+5=10**

**Q8.**

1. Determine the stoichiometric air-to-fuel ratio for combustion of a gaseous fuel consisting of 70% propane (C3H8) and 30% butane (C4H10) by volume.
2. In a counter flow heat exchanger, 30 kg/minute of cold water at 20°C is heated by hot water at 75°C flowing at the rate of 12 kg/minute. If hot water temperature is dropped up to 45°C at the exit, what will be the rise of temperature of cold water?

Also determine *LMTD*, if it is a case of parallel flow heat exchanger. Make realistic assumption.

**4+6=10**

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