

KMU 480
ENERGY TECHNOLOGIES
2017-2018 FALL SEMESTER
HOMEWORK I

Name:

Number:

1. is a flammable black or brownish-black sedimentary rock, usually found in rock layers or in veins called coal deposits or coal seams.

..... is the lowest rank of coal and used almost exclusively as fuel for electric power generation. Jet, a compact form of lignite, is sometimes polished and has been used as an ornamental stone since the Upper Palaeolithic.

.....refers to a purified product that is almost entirely methane.

..... contains compounds other than methane and ethane.

..... contains larger amounts of hydrogen sulphide, which is highly undesirable due to corrosion, and results in SO₂ formation upon combustion.

..... is based on a semiconductor formed between a photo-sensitized anode and an electrolyte, a photoelectrochemical system.

..... is a method of generating electrical power by converting solar radiation into direct current electricity using semiconductors that exhibit the photovoltaic effect.

..... is the thermal energy contained in the rock and fluid (that fills the fractures and pores within the rock) in the earth's crust.

..... is a device that converts kinetic energy from the wind into electrical power. A wind turbine used for charging batteries may be referred to as a wind charger (Total: 10 pnts).

2. How solar panels work? (15 pnts).

3. How geothermal heat pumps work? (15 pnts).

4. The density of air entering the furnace of a steam power plant is 0.69 kg/m³. Air is supplied at the rate of 3000 tons per hour. Determine the volume (m³) of air supplied per second (15 pnts).

5. A steam turbine plant burns 320 tons of coal per hour. The heating value of the coal is 30 700 kJ/kg. The thermal efficiency of the plant is 39.8 percent. Determine the output of the plant in kilowatts (Hint: Efficiency = W/Q) (15 pnts).

6. How much heat is in kJ, is required to heat a tank of 60 kg of air from 270 K to 370 K? (c_{v,air}= 0.2 kJ/(kg.K) (15 pnts).

7. A family uses 0.3 cubic meter of hot water per day. The temperature of the water is increased 70°C as it is heated. Natural gas, having a heating value of 38 000 kJ/m³ is used for heating. It is burned with an efficiency of 75 percent. It costs \$ 0.035 per cubic meter. Calculate the cost of gas per month. (15 pnts).