

## **DEE-53106 Introduction to Renewable Energy Sources**

Examination on 4.3.2016

1. Which of the following statements are true and which are not? Answer just true or false.
  - a) Peat has the second largest known resources of primary energy globally in the world after coal.
  - b) It takes 3-6 months for a wind turbine to produce the energy that goes into production, operation and recycling of the turbine.
  - c) Oil has the highest energy density (in TJ/kg) of all the energy sources used in operational power plants.
  - d) Global share of the primary energy used to generate electrical energy is close to 20 %.
  - e) Discoveries of new oil fields are larger than the consumption.
  
2.
  - a) Name the top four primary energy resources (and technologies) by electric power production capacity installed globally in 2013 (and thereafter). What are their shares?
  - b) How much the average world surface air temperature has been estimated to increase during the next 100 years, if the consumption of fossil fuel continues to grow as it has done during the past decades? How long will it take for the air to cool down back to the present average temperature after all the CO<sub>2</sub> emissions to the atmosphere have ended?
  
3.
  - a) What power production technologies have the two highest growth rates of annually installed new capacity compared to their globally installed cumulative capacity?
  - b) What is a typical conversion efficiency of bioenergy to electrical energy?
  - c) What sources of renewable primary energy does not originate from the Sun (solar radiation) at all?
  
4.
  - a) What energy conversion processes/principles are used to convert the energy of different primary energy sources to electrical energy?
  - b) Which sources of primary energy can be converted to electrical energy directly by using just one conversion? What are the used principles/technologies?