ENRG3310: Introduction to Energy and Sustainability **Midterm I**

Prof. Ognjen Š. Miljanić February 16, 2016

Name: _____ Student ID Number: _____

Last First

Read directions very carefully. Write your answer legibly in the designated spaces. *Total number of points is 150.*

1. Match the fuel with the country in which it is discussed in *Switch* (you may use items in the fuel list more than once).

5 points

_____ ICELAND	A. None of the below
_____ DENMARK	B. Shale oil
_____ CANADA	C. Wind power
_____ SPAIN	D. Hydropower
_____ QATAR	E. Photovoltaic solar
	F. Thermal solar
	G. Nuclear power
	H. Oil shale
	I. Geothermal energy
	K. Shale gas

2. Succinctly describe what happened to the Aral Lake in the past 50 years.

4 points

Give three possible reasons behind the changes that occurred:

3×3 points = 9 points

(1)

(2)

(3)

3. Coal and uranium are both dominantly used to produce electricity in coal-fired and nuclear power plants, respectively. Despite this similarity, these two fuels are very different. List three major differences between them. *3×3 points = 9 points*

(1)

(2)

(3)

4. What is the definition of "Sustainable Development" put forward in the Brundtland Report?

5 points

5. Using the definition of sustainability in the Brundtland Report, do you think that the fuel mix resulting from the long-term switch between today and 2064 described in Tinker's conclusion to the *Switch* will be sustainable? Explain your answer.

20 points

6. A very sparsely furnished room has two fluorescent lightbulbs (25 W), one small fridge (300 W), and a TV (100 W). Assuming that the fridge works 12 hours each day, TV 4 hours, and lightbulbs 8 hours, calculate the total daily energy consumption of this room in kilowatt-hours and joules.

10 points

7. What is the maximum theoretical efficiency of a heat engine that uses steam heated to 450 °C? Do this calculation for an engine operating in (*a*) Houston summer, with the outside temperature of 40 °C, and (*b*) Canadian winter, with the outside temperature of −25 °C.

20 points

8. List standard SI units and one non-SI unit for the following physical quantities:

3×6 points = 18 points

acceleration

energy

length

9. Succinctly define, in your own words, the following concepts:

5×5 points = 25 points

Human Development Index

Earth energy flows

Kilowatt-hour (kWh)

Perpetuum Mobile

Fossil fuels

GROUP PROJECT PROPOSAL

Turn this in separately. *25 points*