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

Prof. Ognjen Š. Miljanić September 16, 2014

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. How is sustainable development defined in *Our Common Future* (The Brundtland Report)?

5 points

2. Where is world's largest liquefied natural gas (LNG) plant located?

3 points

3. List three negative consequences of the disappearance of the Aral Lake (once the biggest lake in Central Asia):

6 points

(1)

(2)

(3)

List two causes behind the disappearance of the Aral Lake: *4 points*

(1)

(2)

4. Among the renewable energy sources, which one satisfies the largest percentage (by far) of our global energy needs? Do you expect this source to grow in relative importance in the future? Why or why not?

7 points

5. Define the difference between *energy flows* and *energy reservoirs*. Which of the two are we using more to generate useful energy in our society?

6 points

6. What energy mix does Scott Tinker propose in *The Switch* as effective in transitioning away from the (currently dominant) coal and oil? Is this mix sustainable? When does he project a cross-over transition point to happen?

10 points

7. One kilogram of gasoline can release approximately 44 MJ of energy when burned. If gasoline is used in an emergency generator—the kind use after hurricanes—this energy content is converted into electricity with 25% efficiency. If you only have 700 g of gasoline (approx. one quart), for how long could you power a 400 W refrigerator? Assume that the refrigerator works all the time.

20 points

8. In 2012, US coal consumption was 430 million tonnes of oil equivalent, but dropping at a 5% annual rate. On the other hand, India consumed coal amounting to 300 million tonnes of oil equivalent, but its consumption is rising by 5% annually. In which year will India overtake the US in terms of coal consumption, assuming these trends hold?

15 points

9. US annual energy consumption is approximately 100 Quads (each Quad is approximately 10^{18} J). What is the average American's rate of energy consumption in Watts? *HINT: You will need to estimate the approximate population of the United States. Errors of up to 25% will be tolerated.*

10 points

10. List standard SI units for the following physical quantities:

3×3 points = 9 points

acceleration

energy

time

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

5×6 points = 30 points

Triple Bottom Line

Power (as a physical quantity)

Kilowatt-hour (kWh)

Kinetic Energy

Earth's Carbon Cycle

GROUP PROJECT PROPOSAL

Turn this in separately.

25 points