

**CONCORDIA UNIVERSITY**  
**Faculty of Engineering and Computer Science**

**EXAMINATION FORM**

<b>Sustainable Development and Environmental Stewardship</b>	<b>ENGR 202</b>	<b>All sections</b>
<b>Final examination</b>	Date: <b>June 18, 2004</b>	Time: <b>14:00 – 17:00</b>
No. of pages: <b>6</b>		
Professor: Radu Zmeureanu		
Material allowed	<b>NO</b>	
Calculators allowed	<b>YES</b>	
Use this examination form to answer all questions The maximum mark for the final examination is 80 <b>Return this examination form and the exam booklet</b>		
Student name:	Student I.D.:	

**QUESTIONS - Class A** (In your response do not repeat the question. Respond shortly and directly to the questions within the space allocated. Additional pages are not allowed. Responses on the back page will not be considered).

1. List the natural and human factors assumed to be the cause of climate change.

**5 marks**

Natural factors:

a: .....

b: .....

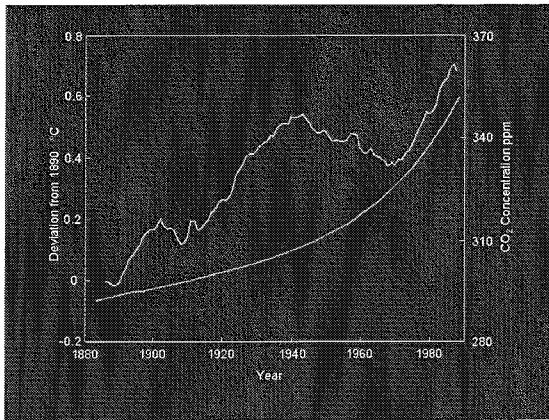
c: .....

Human factors:

a: .....

b: .....

2. Explain how the measurements presented in the figure below contradict the IPCC report, and therefore the Kyoto's assumptions. **5 marks**



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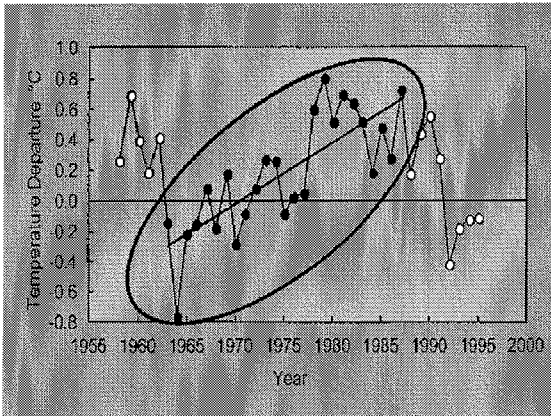
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3. Explain how the measurements presented in the figure below contradict the IPCC report, and therefore the Kyoto's assumptions. **5 marks**



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**QUESTIONS - Class B** (Select only one response for each question. You may select “None” of suggested responses, if you believe this is the case).

1. What are the gases included in the Kyoto protocol ? **5 marks**

CO <sub>2</sub> , CH <sub>4</sub> and NO <sub>x</sub>	CO <sub>2</sub> , CH <sub>4</sub> , Nox, Sox and water vapor	CO <sub>2</sub> , CH <sub>4</sub> , Nox, CFC and HFC	Nox, HFC, PFC and SF <sub>6</sub>	CO <sub>2</sub> , CH <sub>4</sub> , Nox, HFC, PFC and SF <sub>6</sub>
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2. What should be the apparent temperature at Earth surface without the greenhouse gas effect ? **5marks**

-15°C	-10°C	-30°C	0°C	+15°C	None of these values
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3. How many kilograms of CO<sub>2</sub> can be removed from the atmosphere by planting and maintaining one tree (carbon neutral approach) ? **5 marks**

50 kg	100 kg	1000 kg	780 kg	540 kg	None of these values
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4. What is the predicted increase of average Earth surface temperature over the period 1990 to 2100, which is used by IPCC in the preparation of Kyoto protocol ? **5 marks**

15 – 18°C	0.4 – 0.8°C	2 – 5°C	1.4 – 5.8°C	0.4 – 3.0°C	None of these
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5. Climate Change Plan for Canada has three steps for the reduction of CO<sub>2</sub> emissions. How many Mtons of CO<sub>2</sub> emissions per year are expected to be reduced during the second step ? **5 marks**

Suggested response	Check the right response only
50 Mtons	
100 Mtons	
500 Mtons	
1000 Mtons	
2000 Mtons	
None of the above	

6. What is the meaning of **dematerialization** related to the sustainable development?

**5 marks**

Social goal	Demographic goal	Decrease of the embodied energy in materials	Doing more with less	None of these
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7. By 2090, winter temperatures in most of Canada could rise by x-y degrees or more.

What is the (x-y) interval ? **5 marks**

2-4 degrees	3-10 degrees	5-15 degrees	6-18 degrees	None of these
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### **QUESTION- Class C**

Two greenhouse gases are emitted during a manufacturing process: gas A and gas B.

Gas A has the radiative forcing equal to  $1200 \text{ W}/(\text{m}^2 \text{ kg})$ , compared with  $\text{CO}_2$ , and the life duration of 60 years. Gas B has the radiative forcing of  $800 \text{ W}/(\text{m}^2 \text{ kg})$ , compared with  $\text{CO}_2$ , and the life duration of 110 years.

Assuming the time horizon of 100 years, calculate the ratio R between the GWP of gas A and GWP of gas B.

a. Write the formula used to respond to the above question. Indicate the name and units of each variable. **5 marks**

b. Calculate the ratio R (if formula is not presented at point “a” above as requested, then the numerical result receives no marks). **5 marks**

----- End of questions -----