

**UNIVERSITY OF PERADENIYA**  
**Faculty of Engineering**  
ENDSEMESTER EXAMINATION – May 2008  
**CP551 SUSTAINABLE DEVELOPMENT**  
(2 hours)

Answer four (04) out of the five (05) questions. All questions carry equal marks.

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Please note that you are free to take the questions that are framed in general terms and answer with respect to a specific case, context or situation - providing that you make that explicit in your answer.

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- 1) List three different unsustainable energy generation/use practices, and explain why they are unsustainable.

Describe, in point form, how you would improve the sustainability of them.

- 2) Choose an unsustainably developed sector in Sri Lanka, other than the energy sector.

List the unsustainable features of the sector chosen.

Give your recommendations, in point form, to improve the sustainability of the sector chosen.

Critically analyse the unsustainable features of the recommendations made by you.

- 3) Explain the terms “industrial ecology”, “ecological footprint”, “carrying capacity”, and “life cycle analyses”, giving appropriate examples where necessary.

- 4) Indium is a rare metal consumed primarily in the manufacture of liquid crystal displays (LCDs) used in flat-screen TVs and computer monitors. Worldwide consumption of indium is currently at about 1130 tonnes of indium per year inclusive of the recycled indium at a rate of about 60% of indium consumed. Based on content of indium in zinc ore stocks, the worldwide reserve base is estimated to be approximately 6,000 tonnes of economically-viable indium. (1 tonne is equivalent to 1000 kg.)

- a) Assuming that each of the average 7.5 billion people on the planet over the next 50 years is allocated an equal share of indium, determine the allocation of virgin indium per person per year.
- b) Determine the worldwide sustainable limiting rate of indium consumption per person per year.
- c) Is the worldwide indium consumption rate sustainable? Explain your answer.
- d) Comment on the sustainability of the 125 tonnes per year indium consumption rate of United States with its population of about 300 million people.

**Question #5 is on page 2**

- 5) Let us hypothesize that Sri Lanka plans to meet 20% of the 1200 million liters of the estimated petrol (also known as gasoline in countries like United States) requirement in 2020 by bioethanol. Following are two proposals made by Pelwatte Sugar Industries Ltd:

Proposal A: Production of 1140 litres of ethanol along with 8 tonnes of sugar per hectare of sugarcane cultivation.

Proposal B: Production of 5750 litres of ethanol and no sugar per hectare of sugarcane cultivation.

Answer the following:

- a) What is bioethanol? Why do we want to replace petrol by bioethanol?
- b) Determine the land area required to meet the hypothetical bioethanol production target for 2020 in Sri Lanka in each proposal.
- c) Determine the % of forest area to be cleared if the land for sugarcane cultivation should be taken from the forest land. Sri Lankan forest cover was estimated to be 1,938,900 hectares in 2006.
- d) List three sustainable and three unsustainable features of each proposal.

