Name- Entry No- Group No-

ENERGY, ECOLOGY, ENVIRONMENT (ESL 330)

Major Test 4th May *2007*

Duration – 10.30AM to 12.30 PM (Two hours) **Total (80 marks)**

Attempt Part (A) in the space provided in the question paper itself and Part (B) in the answer sheet.

PART (A)

1. a) Indicate if the following statements are True (T) or False (F). **(5 marks)**

i) Most of the gaseous air pollutants are totally transparent with exception of NO_2. ( )
ii) Unlike human beings, plants can not survive even a short term exposure to high concentration of NO_2. ( )
iii) Eye irritating components of photochemical smog are both formic acid and acetic acid. ( )
iv) Availability of NO_2 affects the rate of production of O_3 while the availability of NO affects the rate of destruction of O_3. ( )
v) The CFC number for CCl_2FCClF_2 is 143. ( )

b) Amplify the following terms. **(5 marks)**

i) NMVOC-
ii) TLV-
iii) UNEP-
iv) MUV-
v) ALR-
vi) RSPM-
vii) ZEV-
viii) HSU-
ix) IPCC-
x) ROG-

e) Fill in the Blanks. **(6 marks)**

i) Suspensions of particles having an effective diameter of less than 10 μm are called ----------.
ii) A methane molecule is roughly ---------- times as strong as an infrared absorber as a CO_2 molecule.
iii) From 2005, ---------- emission norms for all categories of 4 –wheelers have been implemented in 11 mega cities of India.
iv) A Bharat stage II norm for CO is recommended to be----------g/km.
v) CO causes its harm by binding with the ----------in blood and forming ----------.

d) Write down the name of the instrument which measures **(3 marks)**

(i) HC level from your Petrol car----

(ii) Smoke level from your Diesel car----

(iii) CO level from a CNG-fuelled auto rickshaw-----

e) Define GWP. Explain what do you understand from the statement **"20 year GWP for N_2O is 280".** **(2 marks)**

f) Name three chlorine-containing compounds which are believed to attack ozone layer. **(3 marks)**

(i)

(ii)

(iii)

g) Fill in the blank and answer the question. Teehnically Earth's Albedo is about -------- %.Till now it is believed that the Moon has no atmosphere and it reflects 12% of ineoming solar radiation. What would happen if

(i) it absorbed all and refleeted none? **(5 marks)**

(ii) if it reflected the same percentage as the Earth?

h. Explain why. **(3 marks)**

i) Visibility is normally much better in dry climates than in moist ones.

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ii) The priee of homes near the beaches or high on the foot hills in Los Angeles command higher prices.

I) Indicate two fuel quality improvement steps introduced in Delhi for Vehicular pollution control

(i) **(2 marks)**

(ii)

J) Write down two main reasons of sea level rise- **(1 mark)**

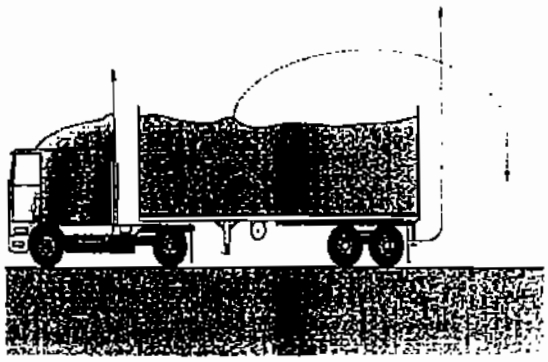
(i)

(ii)

K) Fill in the blanks in the table below **(9 marks)**

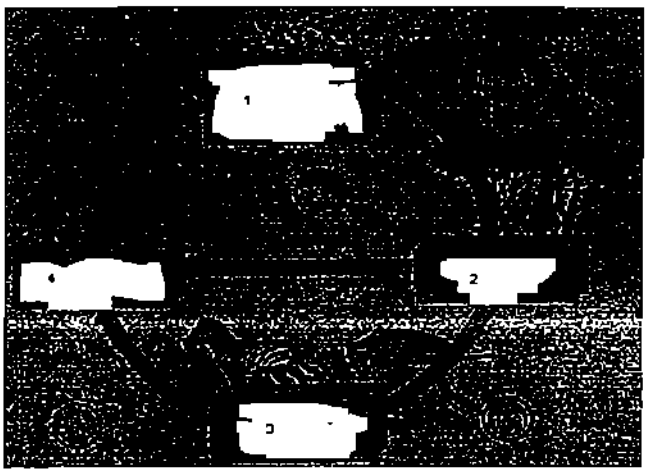
Where occurs →	**Troposphere**	**Stratosphere**
What process Occurs? →		
What Natural Gases involved? →		
Important human inputs →		
What environmental problem? →	**Global warming**	**Ozone Depletion**

L) The figure below shows a truck loaded with sand. It puts three different size of particulate into the atmosphere. Explain their production source and relative size. **(5 marks)**



M) Years ago when smokestacks were only a few stories high, pollution from smokestacks usually stayed near the ground and settled on land nearby. To reduce this pollution government passed a law permitting construction of very tall smokestaeks so that sending pollution high into air would be a problem. The scientists now feel that this was a wrong approach? What your comments on this? **(2 marks)**

N) Comment on the ecosystem and identify 1, 2, 3, and 4 in the figure below. **(2 marks)**



O) At one point of time People in Norway and Sweden had to add powdered limestone to hundreds of lakes and streams. What could be the reason? **(2 marks)**

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PART (B)

2. Demonstrate graphically/through schematic diagrams. **(3 x 6 marks)**

(i) Formation of photochemical smog.
(ii) Pattern of variation of major pollutants in a gasoline (Spark Ignition) engine.
(iii) Radiative forcing of the major greenhouse gases with respect to concentration.
(iii) Energy flow pyramids.
(iv) Flow of energy to and from the earth.
(v) World CFC production indicating the landmark of Montreal protocol.

3. It is believed that doubling the atmospheric concentration of CO_2 causes a radiative forcing of 4.35 W/m^2. If the earth's albedo does not change, estimate the climate sensitivity factor λ and use it to estimate the eventual change in the surface temperature of earth needed to balance incoming and outgoing radiation. Assume suitable data wherever necessary. **(2 marks)**

4. Typical coal burned in power plants has an energy content of approximately 24 kJ/g and an average carbon content of about 62 percent. For almost all new coal plants, Clean Air Act emission standards limit sulfur emissions to 260 g of sulfur dioxide (SO_2) per million kJ of heat input to the plant (130 g of elemental sulfur per 10^6 kJ). They also restrict particulate emissions to 13 g/10^6 kJ. Suppose the average plant burns fuel with 2 percent sulfur content and 10 percent unburnable minerals called **ash**. About 70% of the ash is released as **fly ash** and about 30 percent settles out of the firing chamber and is collected as **bottom ash**. Assume this is a typical coal plant with 3 units of heat energy required to deliver 1 unit of electrical energy.

a) Per kilowatt-hour of electrical energy produced, find the emissions of SO_2, particulates, and carbon (assume all of the carbon in the coal is released to the atmosphere).

b) How efficient must the sulfur emission control system be to meet the sulfur emission limitations?

c) How efficient must the particulate control system be to meet the particulate emission limits? **(6 marks)**