

M. Tech. (Energy Science & Technology) First Year Second Semester Examination – 2019

Subject: ENERGY & ENVIRONMENTAL IMPACT ANALYSIS

Time: Three hours

Full Marks: 100

Answer **any five** questions.

1. a) What are the major sources of air pollution ? What do you mean by 'point sources', 'area sources' and 'line sources' of air pollution ? Give examples. 8
b) What do you mean by primary air pollutants and secondary air pollutants – give examples. What do you mean by 'transport and transformation' of air pollutants ? What is 'receptor' ? 12
2. Estimate stoichiometrically the emissions avoided by a solar photo voltaic power plant per unit of electricity generation taking emission factors of a coal-fired thermal power plant, for 1 kWh of electricity generation, as a standard data.
Data given:
i) 0.65 kg coal is burnt to generate one unit of electricity in a coal-fired thermal power plant;
ii) Average elemental analysis of Indian bituminous coal:
Carbon 51.0%, hydrogen 2.8%, nitrogen 1.0%, sulphur 0.3%, oxygen 6.9%, moisture 8.0%, and ash 30.0%. 20
3. Discuss on the major air pollutants that are added to the atmosphere due to energy conversion and energy use. Discuss on their effects on the environment. What is 'Thermal NO_x' and what is 'Fuel NO_x'? 20
4. What is Environmental Impact Assessment (EIA) ? At which stage EIA is carried out ? Discuss any two methodologies used in EIA study. 20

5. a) What is carbon sequestration ? Discuss on carbon fixation by plants through photosynthesis. 10
- b) Average annual electricity generation from a coal-fired thermal power station is 7350×10^6 kWh / year. Calculate the area of plantation required for absorption of the entire CO_2 emitted by the power plant based on the following data.

Data given:

- i) 1.28 kg CO_2 is emitted per kWh of electricity generation;
- ii) 1 kg CO_2 is absorbed from the atmosphere for 0.55 kg of plant growth;
- iii) Average plant growth rate is 6 ton / ha / year. 10
6. What is Carbon Trading ? Discuss on the three cooperative mechanism of the Kyoto Protocol – Emission Trading, Joint Implementation, and Clean Development Mechanism. 20
7. How 'landfill gas'(LFG) is generated from municipal solid waste dumped into a landfill site ? What is the composition of LFG ? Why it is necessary to estimate CH_4 emissions from the landfill sites ? Describe **any two** mathematical models used to calculate LFG or methane emissions from landfill sites. 2+1+1+16