Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech(CHE-NEW)/SEM-6/CHE-605A/2013

2013

ENVIRONMENTAL ENGINEERING

Time Allotted : 3 Hours *Full Marks* : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : 10 × 1 = 10

i) Which one is greenhouse gas ?

a) oxygen b) nitrogen

c) carbon dioxide d) sulphur dioxide.

ii) Identify the prime constituent of smog

a) water b) sulphur dioxide

c) carbon dioxide d) hydrogen sulphide.

iii) A trickling filter is

a) a rotary drum filter

b) an equipment where biological slime is developed

c) suitable for large scale operation

d) none of these.

iv) Radioactive solid nuclear wastes are disposed off by

a) high temperature incineration

b) pyrolysis

c) underground burial in concrete trenches

d) none of these.

v) A rotating disc contractor is a ..... control equipment.

a) air pollution

b) water pollution

c) dissolved solid

d) none of these.

vi) Ammonical waste water from a urea plant can be made ammonia free water economically by

a) neutralizing with a base

b) stripping with steam

c) reacting with an acid

d) reaction with nitrifying bacteria.

vii) Which of the following can't be used as pretreater to a wet scrubber ?

a) Electrostatic precipitator

b) Bag filter

c) Gravity settling chamber

d) Cyclone separator.

viii) The second most important gas evolved from sludge digestion tank is

a) CO b) CO_2

c) CH_4 d) N_2 .

ix) Block collection is related to the collection of

a) liquid waste b) gaseous pollutants

c) solid waste d) radioactive waste.

x) The municipal waste disposal method using earthworm is

a) composting

b) vermi-composing

c) land filling

d) none of these.

xi) Most efficient fine dust removal equipment is

a) scrubber

b) cyclone separator

c) gravity separator

d) electrostatic precipitation.

xii) Radioactive solid nuclear wastes are disposed off by

a) high temperature incineration

b) pathological incineration

c) pyrolysis

d) underground burial in concrete containers.

GROUP – B
(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. What do you mean by primary and secondary pollutants ? Give an example for each. Indicate the health hazard associated with tow primary air pollutants. 2 + 1 + 2

3. What will be the ratio of BOD_5 at 20°C to that $BOD_{2·5}$ at 35°C ?

4. Describe the process of activated sludge method and its advantages and disadvantages. 3 + 2

5. Define adiabatic lapse rate.

6. What is landfilling ? What are the merits and demerits of refuse stabilization ? 2 + 3

GROUP – C
(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. a) A factory uses 2,00,000 liters of furnace oil (specific density 0·97) per month. If for one million litres of oil used per year, the particulate matter emitted is 3·0 tonnes per year, SO_2 emitted is 59·7 tonnes per year, NO_x emitted is 7·5 tonnes per year, hydrocarbons emitted are 0·37 tonnes per year, and CO is 0·52 tonnes per year, calculate the height of the chimney required to be provided for safe dispersion of the pollutants.

   b) Write short notes on Water (prevention and control of Pollution) Act, 1974. 8 + 7

8. a) Write technical notes on the principle and operation of a Cyclone Separator with a neat sketch.

   b) Discuss the working principle of trickling filters used in the secondary treatment of waste water. 9 + 6

9. a) Define hazardous waste and explain the different types of hazardous wastes. 4

   b) Explain the different techniques of hazardous waste treatment in India. 2

   c) Enumerate the ten categories of waste electronic and electrical equipment as per EU WEEE directives. What are the different hazardous components present in the above equipment ? 3

   d) What is bioremediation ? Explain the role of bioremediation in solid waste management by removing chromium, mercury and lead and creating an eco-friendly environment. 6

10. Describe with diagram the activated sludge process ? Develop an expression for calculating the substrate concentration of an activated sludge process. 5 + 10

11. Write short notes on any *three* of the following : 3 × 5

a) Photochemical smog

b) Incineration

c) Trickling filter

d) Looping, Lofting and coning

e) Integrated solid waste management.