Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech(CHE)/SEM-8/CHE-803/2012

2012

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 : $10 \times 1 = 10$

   i) Ethanolamine is an absorbent used for the removal of ..... from gas/air.
   - a) hydrogen fluoride
   - b) sulpher di-oxide
   - c) hydrogen sulphide
   - d) both (b) and (c).

   ii) Polluted water having low BOD are most economically treated in
   - a) sedimentation tank
   - b) oxidation pond
   - c) sludge digester
   - d) clarifier.

   iii) Which of the following radioactive waste emits all α, β, γ rays and hence in the most hazardous of all radioactive emitters ?
   - a) I-131
   - b) Sr-90
   - c) Au-198
   - d) Ra-226.

   iv) Kyoto protocol is related to
   - a) restriction on the use of CFCs
   - b) reduction of greenhouse gases
   - c) disaster management
   - d) none of these.

v) Which of the following doesn't discharge the dust collected as a dry solid ?
   a) Electrostatic precipitator
   b) Wet scrubber
   c) Bag filter
   d) Gravity settling chamber.

vi) Cyanide in drinking water should be less than
   a) 0·01 mg/l b) 0·05 mg/l
   c) 0·15 mg/l d) 0·50 mg/l.

vii) Kerbside Collection means the waste
   a) is brought in container and placed on the footway
   b) is brought in containers by individuals to a waiting vehicle
   c) both the ways
   d) none of these.

viii) The waste liquor from electroplating industries can be treated using
   a) bioremediation b) phosphate treatment
   c) pisciculture d) radio-active treatment.

ix) Colour of wastewater containing textile dyes can be measured in ..... units.
   a) NTU b) Nanometer
   c) Hazen d) Lumen.

x) Photochemical smog gives rise to
   a) carbon dioxide b) carbon monoxide
   c) PAN d) PM-2.

xi) The size of RSPM is
   a) 10 µ b) 20 µ
   c) 100 µ d) < or = 10 µ.

xii) Most efficient fine dust removal equipment is
   a) scrubber
   b) cyclone separator
   c) gravity separator
   d) electrostatic precipitation.

GROUP – B
(Short Answer Type Questions)

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

2. Discuss in detail the methodology of removal of mercury from liquid streams.
3. Compare the characteristic of liquid waste from paper and pulp industry and dairy industries.
4. What is landfilling ? What are the merits and demerits of refuse stabilization ? 2 + 3
5. What are the various methods of treatment of effluent gases containing organic vapour ? Discuss briefly.
6. A municipal water treatment plant serving a city of 2,00,000 discharges 1·10 m^3/s of treated effluent having an ultimate BOD of 50 mg/L into a stream that has a flow of 8·7 m^3/s and a BOD of its own equal to 6·0 mg/L. The deoxygenation constant k_d is 0·2 day^{-1}.
   a) Assuming complete and instantaneous mixing estimate the ultimate BOD of the rever just downstream from the outfall.
   b) If the stream has constant cross section so that it flows at a fixed speed equal to 0·30 m/s estimate the BOD of the stream at a distance 30,000 m downstream. 2 + 3

GROUP – C
(Long Answer Type Questions)

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

7. a) Discuss the different principal issues facing large municipalities in handling large volume of solid waste generated.
   b) Differentiate between composting and vermicomposting ?
   c) What is vermiculture ? How is it related with soil conditioning ? 8 + 2 + (2 + 3)

8. Discuss the methodology of environmental management in fertilizer industries.

9. a) Differentiate between primary and secondary air pollutants with examples.

   b) Describe the working principle of fabric filter.

   c) Determine the collection efficiency of the electrostatic precipitator described below for a particle 154 µm in diameter having a drift velocity of 0·184 m/s. What is the effect of reducing the plate spacing to one-half of its current value and doubling the number of plates ?

   ESP specifications : Height = 7·32 m, Length = 6·00 m, No. of passages = 5, Plate spacing = 0·28 m, Gas flow rate = 19·73 m^3/s. 3 + 3 + 9

10. a) What are the methods adopted in primary treatment of waste water ?

    b) Discuss the process of sand filtration with neat sketch.

    c) What are the advantages and disadvantages of slow sand filter and pressure sand filter ?

    d) Explain the process of disinfection and compare the effectiveness of different chemicals used in disinfection process. 2 + 5 + 3 + 5

11. Write technical note on any *three* of the following : 5 + 5 + 5

    a) Oxidation pond

    b) Composting

    c) Oxygen sag curve

    d) Photochemical smog

    e) Ion exchange process

    f) Upflow activated sludge blanket process.