Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH(CHE-NEW)/SEM-8/CHE-803/2010

2010

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) As per the CPCB standard for discharge of liquid waste into inland surface water the values of BOD in mg/l for treated waste water is

   a) 150 b) 0

   c) 30 d) > 150.

   ii) The daily average standard of PM_{10} in $\mu g/m^3$ according to CPCB is

   a) 100 b) 60

   c) 200 d) > 300.

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) For municipal sewage the ratio of BOD to COD

a) is greater than unity

b) is ranging from 0.4 to 0.8

c) is infinity

d) none of these.

v) Among different secondary treatment options ..... ranks best.

a) Trickling Filter

b) Activated Sludge Process

c) Extended Aeration System

d) Rotating Biological Disc Contactor.

vi) The theme of World Environment Day, 2010 is related to

a) Water Management b) Clean Cities

c) Noise Pollution d) Bio-diversity.

vii) Photochemical smog gives rise to

a) Carbon dioxide b) Carbon monoxide

c) PAN d) PM-2.

viii) The size of RSPM is

a) 10 μ b) 20 μ

c) 100 μ d) < or = 10 μ.

ix) In tertiary treatment of wastewater Poly-aluminum chloride is used to

a) reduce sludge volume

b) increase sludge volume

c) disinfect water

d) reduce BOD.

x) The waste liquor from wastepaper based paper mill

a) contains lignin

b) does not contain lignin

c) has BOD level < 40 mg/l

d) none of these.

xi) In a trickling filter, if the recirculation factor (F) is unity, then the ratio, volume of sewage recalculated to the volume of raw sewage is

a) 1 b) 0.5

c) 0 d) 1.5.

xii) Absence of fish along river indicates

a) zone of degradation

b) zone of active decomposition

c) zone of recovery

d) all zones of pollution.

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 one example of both. Indicate the health hazard associated with two primary air pollutants.

3. Discuss the methodology of conducting a 5 day BOD test.

4. Discuss the methodology of collection and transfer of solid waste in a metropolitan city.

5. What is windrose ? Explain the methodology of its construction.

6. What is Bioremediation ? Explain in brief how this method is helpful for eco-friendly solid waste management.

GROUP – C

(Long Answer Type Questions)

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

7. Write comprehensive notes on any one of the following environmental legislations :

   i) Water (Prevention and Control of Pollution) Act, 1974.

   ii) Air (Prevention and Control of Pollution) Act, 1981.

   iii) A factory uses 2,00,000 litres 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 carbon monoxide is 0.52 tonnes per year, calculate the height of the chimney required to be provided for safe dispersion of the pollutants. 7 + 8

8. A waste water treatment plant discharges 1.0 m^3 /s of effluent having an ultimate BOD of 40.0 mg/L, into a stream flowing 10.0 m^3 /s. Just upstream from the discharge point, the stream has an ultimate BOD of 3.0 mg/L. The deoxygenation rate coefficient is 0.22/day. Assuming complete and instantaneous mixing, find ultimate BOD of the mixture of waste and river just downstream from the outfall. Assuming a constant cross-sectional area for the stream equal to 55 m^2 , what ultimate BOD would you expect to find at a point 10,000 m downstream ? 15

9. Write technical notes on the following : 5 + 5 + 5

   a) Upflow anaerobic sludge blanket

   b) Water soluble packets

   c) Treatment of liquid waste from electroplating industries.

10. a) Explain the characteristics of waste from a typical fertilizer plants. Draw the flow chart and explain the treatment of fertilizer industry waste water. 10

    b) What are the various methods of treatment of Refinery liquid waste ? 5

11. Briefly explain the terms below by identifying and discussing the typical environmental pollution sources that causes these phenomena. In addition provide a possible engineering solution for each of the four environmental phenomena :

    5 + 5 + 5

    i) Greenhouse effect

    ii) Ozone depletion

    iii) Acid rain.

12. Write technical notes on any *two* of the following : $2 \times 7\frac{1}{2}$

i) Treatment of liquid waste from tanneries

ii) Ranking of waste water treatment alternatives

iii) The principle and operation of a Cyclone Separator with a neat sketch

iv) Recycling of Plastics.