Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech (CE-OLD)/SEM-5/CE-503/2010-11

2010-11

ENVIRONMENT ENGINEERING – I

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 the following : 10 × 1 = 10

   i) The growth of population can be conveniently represented by a curve which is menable to mathematical solution. The type of curve is

      a) Semi log curve b) Straight line curve

      c) Logistic curve d) Exponential curve.

   ii) Population forecast by the Manual on water supply and treatment recommends to use

      a) arithmetical increase method

      b) geometrical increase method

      c) incremental increase method

      d) Decreased rate of growth method.

iii) Design period for water treatment plant is

a) 50 years b) 30 years

c) 40 years d) 15 years.

iv) The turbidity, which can be seen early on naked eye, in of the order of

a) 1 JTU b) 2 JTW

c) 3 JTW d) 5 JTU.

v) The permissible turbidity of domestic water in between (1 JTU = 1 P.PM)

a) 10 – 15 JTU b) 12 – 15 JTU

c) 5 – 10 JTU d) none of these.

vi) Blue baby disease may be caused in infants due to drinking water, containing higher concentration of

a) Nitrites b) Nitrates

c) Lead d) Arsenic.

vii) Discharge per unit draw down in case of an aquifer is known as

a) Specific yeild b) Specific capacity

c) Field capacity d) None of these.

viii) The hardness of water to cations is mainly due to

a) Ca^{+2} and Mg^{+2} b) Al^{+3}

c) Na^{+} d) None of these.

ix) The bacteria which survive in presence of as well as absence of Oxygen, are called

a) Anaerobic b) Facultative

c) *B*-Coli d) *E*-Coli.

x) The treatment which are generally given to treat raw water supplies, follow the sequence

a) Screening, sedimentation, disinfection, filtration

b) Screening, sedimentation, filtration, disinfection

c) Screening, sedimentation, disinfection, aeration

d) Screening, sedimentation, coagulation, filtration, disinfection.

GROUP – B

(Short Answer Type Questions)

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

2. Define coagulation & floculation. Write only the chemical reaction of coagulation with alum used as coagulant.

3. Write down the dupit's formula for discharge of an unconfined acquifer showing the following with neat sketches :

   a) Circle of influence

   b) Drawdown curve

   c) Static water level

   d) Draw down level.

4. What is break point chlorination & resudial chlorine in water ? Draw the curve.

5. Calculate the fire demand for a city having population 1·75 lacs in cumec using at least three formulae.

6. State the different types of water demand considered during the completion of a project.

GROUP – C

(Long Answer Type Questions)

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

7. a) Define plain sedimentation.

b) Derive the expression for settling velocity under laminar flow conditions for a sedimentation tank.

c) Find the settling velocity of spherical silica particle of specific gravity 2·67 in water 25°C, of diameter of particle is 0·004 cm [At 25°C u = 0·90 centistoke, 1 centistoke = 0·01 cm^2/sec. 4 + 5 + 6

8. a) At a water treatment plant 15 million litres of water is treated daily using ferrous sulphate and lime. If the dosage of ferrous sulphate is 12 mg per litre, determine the total quantities of ferrous sulphate and lime required daily.

b) The maximum daily demand at a water purification plant has been estimated as 15 MLD. Design the dimensions of a suitable sedimentation tank for the raw supplies assuring a detention period of 6 hrs. and the velocity of flow as 20 cm/min. 7 + 8

9. a) Discuss the types of reservoirs.

b) Discuss operating troubles in Rapid Sand filter unit and their remedial measure.

c) Calculate the strong required to supply the demand in table I, if the inflow of water to the reservoir is maintained at a uniform rate throughout 24 hrs.

Time	**Demand (Million litres)**
00 – 04	0·48
04 – 08	0·87
08 – 12	1·33
12 – 16	1·00
16 – 20	0·82
20 – 24	0·54

3 + 5 + 7

10. a) The pH of a water sample is given as 8. The ionization constant at 20°C is given as $2{\cdot}5\times10^{-8}$ moles/litre. Determine the percentages of HOCl and OCl^{-}.

b) Define biodegradable organic & BOD. Define chemical oxygen demand (COD) and total organic carbon (TOC) and discuss them.

c) Chlorine usage in the treatment of 20000 m^3/day is 8 kg/day. The residual after 10 min contact is 0·20 mg/L. Calculate the dosage in milligrams per litre and chlorine demand of water. 5 + 5 + 5

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

a) Forecasting population – different methods

b) Slow sand filter and rapid sand filter

c) Water borne diseases

d) Sources of water.