Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech(CE)/SEM-5/CE-503/2009-10

2009

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) The average daily water consumption of a city is 24000 cu.m. The maximum daily demand in such a case will be

a) 4800 cu.m b) 36000 cu.m

c) 30000 cu.m d) none of these.

ii) The ratio of maximum daily demand to average daily demand is

a) 1·8 b) 1·2

c) 1·48 d) 2·7.

iii) Per capita demand is

a) total yearly water requirement (litres) / 365X Population

b) total yearly water requirement (litres) / Population

c) total yearly water requirement (litres) / Design Population

d) total yearly water requirement (litres) / 365X Design Population.

iv) Water supply projects under normal circumstances are designed for a design period of

a) 25 years b) 15 years

c) 30 years d) 20 years.

v) Which of the following is not a sub-surface source ?

a) storage reservoirs

b) springs

c) infiltration galleries

d) tube wells.

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

a) specific yield b) specific capacity

c) field capacity d) none of these.

vii) What percentage of freshwater is surface water ?

a) 2·5% b) 2%

c) 2·2% d) 1·5%.

viii) If present in water, chlorination of water does not reduce the

a) ammonia content

b) organic matter content

c) B.O.D.

d) dissolved oxygen content.

ix) The efficiency of sedimentation tank does not depend upon

a) detention time

b) depth of the tank

c) length of the tank

d) horizontal velocity of water.

x) Safe water is one which does not contain

a) pathogenic bacteria b) turbidity

c) any colour d) any test.

xi) Temporary hardness in water is caused by

a) bicarbonates of Ca^{++} and Mg^{++}

b) Sulphates of Ca^{++} and Mg^{++}

c) Chlorides of Ca^{++} and Mg^{++}

d) Nitrates of Ca^{++} and Mg^{++} .

xii) If total hardness of water is greater than its total alkalinity the carbonate hardness will be equal to

a) total alkalinity

b) total hardness

c) total alkalinity — total hardness

d) non-carbonate hardness.

xiii) The suitable layout of distribution system for a city with roads of rectangular pattern is

a) grid iron system b) dead end system

c) ring system d) radial system.

xiv) At break point chlorination the residual chlorine

a) is zero b) is maximum

c) is minimum d) reappears.

GROUP – B

(Short Answer Type Questions)

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

2. What is design period ? Which factors affect the per capita demand ?

3. How can the yield of an open well be determined ? Describe the recuperation test for finding the yield of an open well.

4. Write short notes on

a) pH value, its significance

b) hardness.

5. Write down the difference between rapid sand filter and slow sand filter.

6. What is meant by pre-chlorinating, post-chlorinating and break point chlorination ?

GROUP – C

(Long Answer Type Questions)

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

7. a) The following data have been noted from the census department :

Year	Population
1940	8,000
1950	12,000
1960	17,000
1970	22,500

Calculate the probable population in the year 1980, 1990 and 2000 by following methods :

i) Arithmetical Increase method

ii) Geometrical Increase method

iii) Incremental Increase method. 10

b) A tube well penetrates a confined aquifer completely. Determine the diameter of the well from the following data :

i) Required yield = 100 lits/sec

ii) Radius of circle of influence = 200 m

iii) Thickness of confined aquifer = 30 m

iv) Draw down = 5 m

v) Coefficient of permeability = 60 m/day. 5

8. a) Derive the velocity of sedimentation tank. 5

b) A water has to purify the water for a town whose daily demand is 9 MLD. Design the suitable sedimentation tank of the water works fitted with mechanical sludge remover. Assume the velocity of flow in the sedimentation tank as 22 cm/min. and the detention period as 8 hrs. 10

9. Write short notes on any *three* of the following : 3 × 5 = 15

a) Fire demand

b) Logistic curve method

c) Water softening

d) Total solids

e) Infiltration gallery.

10. a) If a rectangular sedimentation tank is treating 2·5 MLD. The size of tank is 17·5 × 5·5 × 3·5 m if 80 ppm suspended solids are present in the water; assuming the 75% removal in the basin and the average specific gravity as 2·0, determine the followings :

i) Average flow of water through tank

ii) Detention time

iii) Deposition of the solids in the tank

iv) Overflow rate. 8

b) What is chlorine demand ? Draw the chlorine demand curve.

Chlorine usage in the treatment of 20,000 m^3 /day is 8 kg/day. The residual after 10 min. contact is 0·20 mg/l. Calculate the dosage in mg/l and chlorine demand of the water. 7

11. a) What are the requirements of a good distribution system ? Describe in brief various types of distribution systems. 7

b) Calculate the storage required to supply the demand shown in the following table if the inflow of water to the reservoir is maintained at a uniform rate throughout 24 hrs. :

Time(hrs)	00-04	04-08	08-12	12-16	16-20	20-24
Demand in million litres	0·48	0·87	1·33	1·00	0·82	0·54

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