



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 :

$$10 \times 1 = 10$$

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

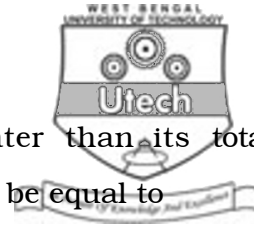
- |         |         |
|---------|---------|
| a) 1.8  | b) 1.2  |
| c) 1.48 | d) 2.7. |



- iii) Per capita demand is
- a)  $\frac{\text{total yearly water requirement ( litres )}}{\text{Population}}$
  - b)  $\frac{\text{total yearly water requirement ( litres )}}{\text{Population}}$
  - c)  $\frac{\text{total yearly water requirement ( litres )}}{\text{Design Population}}$
  - d)  $\frac{\text{total yearly water requirement ( litres )}}{365 \times \text{Design Population}}$ .
- 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  $\text{Ca}^{++}$  and  $\text{Mg}^{++}$
  - b) Sulphates of  $\text{Ca}^{++}$  and  $\text{Mg}^{++}$
  - c) Chlorides of  $\text{Ca}^{++}$  and  $\text{Mg}^{++}$
  - d) Nitrates of  $\text{Ca}^{++}$  and  $\text{Mg}^{++}$  .



- 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.                       $3 \times 5 = 15$

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.  $3 \times 15 = 45$

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

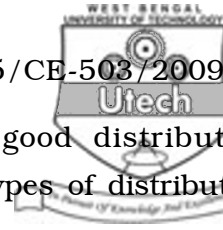
Year	Population
1940	8,000
1950	12,000
1960	17,000
1970	22,500

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 :  $3 \times 5 = 15$
- 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  $17.5 \times 5.5 \times 3.5$  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  $20,000 \text{ m}^3$  /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. :

<i>Time(hrs)</i>	00-04	04-08	08-12	12-16	16-20	20-24
<i>Demand in million litres</i>	0.48	0.87	1.33	1.00	0.82	0.54

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