

Total No. of printed pages = 6

27/06/18

CE 131606

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2018

B.Tech. 6th Semester End-Term Examination

ENVIRONMENTAL ENGINEERING I

Full Marks – 100

Time – Three hours

The figures in the margin indicate full marks
for the questions.

Answer question No. 1 and any Six from the rest.

1. Multiple choice questions: choose the right answer:
(10 × 1 = 10)

(a) The continuous flow of water may be expected
from

- (i) Surface springs
- (ii) Artesian springs
- (iii) gravity springs
- (iv) All of these

(b) Absolute pure water is good for health

- (i) Right
- (ii) Wrong

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- (c) For large cities, the suitable method for forecasting population is
- (i) Arithmetical increase method
 - (ii) graphical method
 - (iii) Geometrical increase method
 - (iv) comparative method
- (d) Suspended impurities consist of
- (i) Iron (ii) chlorine
 - (iii) bacteria (iv) all of these
- (e) The presence of _____ causes red colour in water.
- (i) Iron
 - (ii) Manganese
 - (iii) Sodium fluoride
 - (iv) Calcium carbonate
- (f) The maximum permissible quantity of lead in water for domestic supplies is
- (i) 0.01 ppm (ii) 0.05 ppm
 - (iii) 0.50 ppm (iv) 1 ppm
- (g) The volume of a settling basin is large due to
- (i) Large volumes of floc added for coagulation
 - (ii) Large amount of water entrapped into it
 - (iii) Greater amount of suspended solids to be removed
 - (iv) None of the above

- (h) Rate of filtration of a slow sand filter ranges from
- (i) 10 to 100 litres/h/m²
 - (ii) 100 to 200 litres/h/m²
 - (iii) 200 to 400 litres/h/m²
 - (iv) 400 to 1000 litres/h/m²
- (i) The process of killing pathogenic bacteria from water is called
- (i) Sedimentation
 - (ii) Filtration
 - (iii) Coagulation
 - (iv) Disinfection
- (j) For a city or town with roads of rectangular pattern, the type of layout used for the distribution of pipes is
- (i) Dead end system
 - (ii) Ring system
 - (iii) Radial system
 - (iv) Grid iron system.

2. (a) What is the need for a planned water supply system? (3)
- (b) Briefly discuss about the municipal water supply system units. (6)
- (c) What are the sources of water used in water supply schemes? (3)
- (d) Write briefly about the general requirements of pumps. (3)

3. (a) What do you mean by per capita demand and design period? (3)
- (b) Explain the importance of population forecast in the design of a water supply system. (2)
- (c) The population of 5 decades from 1975 to 2015 is given below. Find out the population after one and two decades beyond the last known decade by using
- (i) Arithmetical increase method
- (ii) Geometrical increase method
- (iii) Incremental increase method (10)

Year	1975	1985	1995	2005	2015
Population	26000	29000	35000	43000	48000

4. (a) What are conduits? Briefly discuss about the various types of conduits used in a water supply system. (1+3=4)
- (b) An artesian tube well yields 0.08 cumecs of water under a drawdown of 5 m. The thickness of the aquifer is 30 m and its permeability coefficient is 60m/day. If radius of circle of influence is 300m, find the diameter of the well. (5)
- (c) What are intakes? Describe the canal intake and reservoir intake? (1+5=6)

5. (a) Why is water analysis done? Describe in brief about the various tests conducted for physical examination of water. (2+5=7)
- (b) What causes hardness in water? What are the different types of hardness? Name the methods to remove hardness. (1+2+2=5)
- (c) What are indicator organisms? Name some water borne diseases. (1+2=3)
6. (a) Write sequentially the treatment processes adopted when the source of water for a supply scheme is surface water. (5)
- (b) Why is it necessary to adopt coagulation aided sedimentation. State the factors affecting coagulation. (1+3=4)
- (c) Find the dimensions of a rectangular sedimentation basin for the following data:
- (i) Volume of water to be treated = 3 million litres per day
- (ii) Detention period = 4 hours
- (iii) Velocity of flow = 12cm/sec. (6)
7. (a) Explain the phenomenon of filtration on the basis of various actions in filters. (5)
- (b) Describe the working of a slow sand filter using a diagrammatic section. (5)
- (c) A city has a population of 100,000 with an average rate of demand of 160 litres per head per day. Find the area of rapid sand filters. (5)

8. (a) What is chlorine demand? (2)
- (b) Chlorine usage in the treatment of 25000m³/day is 9 kg/day. The residual chlorine after 10 minutes contact is 0.2 mg/l. Calculate the dosage in milligrams per litre and the chlorine of the water. (5)
- (c) Write short notes on any four of the following:
(4 × 2 = 8)
- (i) Breakpoint chlorination
 - (ii) Colour, odour and taste removal
 - (iii) Water softening
 - (iv) Ozonation
 - (v) Desalination
 - (vi) Economical diameter of rising main.

9. (a) What are the methods of distribution of water in a water supply system? Explain with a neat sketch. (5)
- (b) A town with a population of 1 million has a continuous water supply. Average supply is taken as 230 lpcd. The supply is done by direct pumping. The total supply of 230 lpcd is patterned as:

Time	lpcd
6 A.M. to 12 noon	80
12 noon to 4 P.M	45
4 P.M to 10 P.M	73
10 P.M. to 12 midnight	20
12 midnight to 6 A.M.	10

Water is supplied at a uniform rate of 10 million litres per hour. Find out the capacity of the reservoir required for the distribution of water. Assume fire demand of 4 hours. (10)