Total No. of printed pages = 8

END SEMESTER EXAMINATION - 2019

Semester – 5th

Subject Code : CT-506

ENVIRONMENTAL ENGINEERING

Full Marks – 70

Time – Three hours

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

PART – A

Marks – 25

All questions are compulsory.

1. (a) Increase in population of a rapidly growing city, may be estimated by

   (a) Arithmetic increase method

   (b) Geometric increase method

   (c) Incremental increase method

   (d) All of the above

[Turn over

(b) Per capita water demand is defined as the litres of water consumed everyday by each person. It has to be some average value, over a period of time. Over how much period, the averaging is done here ?

(a) 24 hours (b) 10 years

(c) 1 year (d) 30 years

(c) The average domestic water consumption per capita per day for an Indian city, as per IS 1172-1993 may be taken as

(a) 1351/c/d

(b) 2101/c/d

(c) 2401/c/d

(d) 2701/c/d

(d) As compared to the geometrical increase method of population forecasting, the arithmetical method gives future population of a city, the factor to be considered, is

(a) Equal value

(b) Lesser value

(c) Higher value

(d) May vary on population figures

(e) Blue baby disease is caused due to

(a) Chlorides (b) Nitrites

(c) Nitrates (d) Sulphide

(f) Water losses in water supply system are assumed as

(a) 5% (b) 7%

(c) 15% (d) 55%

(g) Modern turbidimeters, working on the principle of scattering of light are known as

(a) Spectrometers

(b) Tintometers

(c) Nephelometers

(d) Optimeters

(h) The suitable method for disinfection of swimming pool water is

(a) UV rays treatment

(b) Lime treatment

(c) Chlorination

(d) By adding potassium permanganate

(i) The suitable layout for a water supply distribution system, for a city of roads of rectangular pattern is

(a) Dead end system

(b) Grid iron system

(c) Ring system

(d) All of the above

(j) Disinfection of water helps in

(a) Killing pathogenic bacteria

(b) Removing turbidity

(c) Removing hardness

(d) Sterilization

(k) Mostly used coagulant is chlorine. (True/false)

(l) Permanent hardness of water can be removed by Zeolite process. (True/false)

(m) Cleaning of rapid sand filter is done by backwashing. (True/false)

(n) BOD of treated water should be nil. (True/false)

(o) pH of water indicates only its acidity. (True/false)

(p) Baylis turbidimeter is preferred when turbidity value is less than 5 ppm. (True/false)

(q) Water is considered hard if its hardness is in the order of 50 ppm. (True/false)

(r) Dental caries in children may caused due to water supplies which are deficient in fluorides. (True/false)

(s) To remove very fine suspended particles from water, the method adopted is called sedimentation process. (True/false)

(t) The bacteria which survive in the absence of oxygen are called B-coli. (True/false)

(u) One degree of hardness of water means a content of salts of _____ mg/1.

(v) Maximum threshold number permitted for indicating the odour of public water supplies is _____.

(w) The total domestic consumption in a city water supply is assumed to be _____ %.

(x) The limit of chloride in drinking water as per IS Code is _____.

(y) If G is the specific gravity of particles of diameter d, the velocity of settlement V in still water at T°C, according to Stoke's law, is _____.

PART – B

Marks – 45

All questions are compulsory.

2. (i) Explain the various treatment processes that are adopted in water treatment plant. 10

(ii) Describe dry methods of application of coagulants. 5

Or

(i) Derive Stoke's law for settlement of discrete particles in water. 7

(ii) Discuss briefly the necessity of replacing the conservancy system by the water carriage system of sanitation. State the factors on which the storm water flow on an area depends. 8

3. A town has a population of 80,000 persons with a per capita water supply of 180 litres per day of which 80% of it appears as sewage. Design a sewer running 0.5 times full at maximum discharge. Take a constant value of N = 0.013 at all depths of flow. The sewer is to be laid at a slope of 1 in 400. 5

Or

For a small town having projected population of 30,000 residing over an area of 20 hectares, find the design discharge for the combined sewer for the following data :

Rate of water supply = 150 litres per capita per day

Runoff coefficient = 0.4

Time of concentration = 30 min.

Assume 70% of this water supply will be reaching the sewer as sanitary sewage. 5

4. Design a rapid sand filter to treat 4 million litres of raw water per day. Half an hour per day is used for backwashing. The rate of filtration is 5000 $1/h/m^2$ of bed. Assume necessary data. 10

Or

Draw a neat sketch of slow sand filter and describe how it works. Compare slow sand filter and rapid sand filter. 10

5. Explain the terms : 2×5=10

Detention period

Screening

Super chlorination

Coagulation

Disinfection.

Or

(i) Design a plain sedimentation tank to treat 6 million litres water per day. Take a detention period of 8 hours and assume a depth of 3.5m. 5

(ii) Find the settling velocity of a silica particles of specific gravity 2.65 at 20°C, if the diameter of particles 0.02 cm. 5

6. Describe various types of coagulant commonly used in water treatment. 5

Or

Explain in brief various disinfecting agents. 5