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END SEMESTER EXAMINATION, NOVEMBER- 2018

Semester – 5th

Subject Code : CT-506

ENVIRONMENTAL ENGINEERING

Full Marks – 70

Pass Marks – 28

Time – Three hours

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

PART – A

All **the questions are compulsory.** 1×25=25

1. (i) When the reduced level of the water source is higher than the reduced level of the consumer's place, water is generally supplied

(a) By pumping system

(b) By gravitational system

(c) Both (a) and (b)

(d) All of the above

(ii) Turbidity of raw water is a measure of

(a) Suspended solids

(b) Acidity of water

(c) B.O.D

(d) None of these

(iii) The process of passing water through beds of granular materials, is called

(a) Screening

(b) Sedimentation

(c) Filtration

(d) None of these

(iv) For the prediction of future population of a city, the factor to be considered, is

(a) Births

(b) Deaths

(c) Migrants

(d) All the above

(v) Blue baby disease is caused due to

(a) Chlorides (b) Nitrites

(c) Nitrates (d) Sulphide

(vi) The population of a city in 2000 is 50,000. The average increase in population over last 8 decades is 7500 and average incremental increase during 8 decades is 750. The population of the city based on incremental method, in the year 2020 will be

(a) 55,000 (b) 60,500

(c) 66,500 (d) 72,500

(vii) The bacteria which require free oxygen for their survival, are called

(a) Aerobic bacteria

(b) Anaerobic bacteria

(c) Facultative bacteria

(d) None of these

(viii) The main disadvantage of hard water, is

(a) Greater soap consumption

(b) Scaling of boilers

(c) Corrosion and incrustation of pipes

(d) All of the above

(ix) Pick up the correct statement from the following :

(a) Lime may be used to soften the hard water.

(b) Excessive use of lime may kill the bacteria.

(c) Excessive lime when added to water, raises its pH value.

(d) All of the above.

(x) Pick up the incorrect statement from the following :

(a) The pH value of water indicates the logarithm of reciprocal of hydrogen ion concentration in water.

(b) Higher value of pH means lower hydrogen ion concentration.

(c) Lower value of pH means higher hydrogen ion contraction.

(d) Lower value of pH gives alkaline solution.

(xi) Mostly used coagulant, is

(a) Chlorine (b) Alum

(c) Lime (d) Bleaching powder

(xii) A city supply includes

(a) Domestic water demand

(b) Industrial and commercial water demands

(c) Demand for public uses and fire

(d) All of the above

(xiii) Pick up the correct statement from the following :

(a) A hydrograph is a plot of discharge versus time.

(b) A mass curve is a plot of accumulated flow versus time.

(c) The mass curve continuously rises.

(d) All of the above

(xiv) 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

(a) $V = 418\ (G - 1)\ d^2\ [(3T + 70)/100]$

(b) $V = 418\ (G - 1)\ d\ [(3T - 70)/100]$

(c) $V = 418\ (G - 1)\ d^2\ [(2T + 70)/100]$

(d) $V = 418\ (G - 1)\ d^4\ [(3T + 70)/100]$

(xv) Maximum threshold number permitted for indicating the odour of public water supplies, is

(a) 1 (b) 2

(c) 3 (d) 4

(xvi) Pick up the incorrect statement from the following. The underground sources of water, is from

(a) Wells

(b) Springs

(c) Infiltration wells

(d) Storage reservoirs

(xvii) Pick up the correct statement from the following :

(a) Domestic use of water is 50% of total consumption.

(b) Average consumption of commercial use of water is 25% of total consumption.

(c) Waste water and leakage is 15% of total consumption.

(d) All of the above.

(xviii) One degree of hardness of water means a content of salts of

(a) 10.25 mg/litres

(b) 12.25 mg/litres

(c) 14.25 mg/litres

(d) 16.25 mg/litres

(xix) To remove very fine suspended particles from water, the method adopted is

(a) Screening

(b) Sedimentation

(c) Boiling

(d) Filtration

(xx) The detention period for plain sedimentation water tanks, is usually

(a) 4 to 8 hours

(b) 8 to 16 hours

(c) 16 to 24 hours

(d) 24 to 36 hours

(xxi) Hardness of water can be removed by boiling if it is due to

(a) Calcium bicarbonates

(b) Calcium sulphate

(c) Calcium chloride

(d) Calcium nitrates

(xxii) Pick up the correct statement from the following :

(a) The pH value of neutral water is 7.

(b) The maximum acidity is obtained when pH value is zero.

(c) The maximum alkalinity is obtained when pH value is 14.

(d) All of the above.

(xxiii) Detention period of a settling tank is

(a) Average theoretical time required for water to flow through the tank

(b) Time required for flow of water to fill the tank fully

(c) Average time for which water is retained in tank

(d) All of the above

(xxiv) Generally, first portion of a logistic curve for the population growth of a developing city, represents the growth of

(a) Increasing (b) Decreasing

(c) Constant (d) All of the above

(xxv) Permanent hardness of water can be removed by

(a) Adding alum (b) Adding lime

(c) Adding chlorine (d) Zeolite process

PART – B

Marks – 45

Answer *all* questions.

2. Design a rapid sand filter to treat 10 million litres of raw water per day allowing 5% of filtered water for backwashing. Half hour per day is used for backwashing. The rate of filtration be 5000 l/h/m^2 of bed. Assume necessary data. 15

Or

(i) Explain sedimentation process in water treatment plant. 7

(ii) Draw L-section of a sedimentation tank indicating the various zone. 8

3. What are the requirements of good distribution system ? 6

Or

What do you understand by coagulation and flocculation ? 6

4. Draw the schematic layout of a typical water treatment plant of a city. 8

Or

Describe in brief various types of screens used for screening water. 8

5. A combined sewer is to be designed to serve an area of 60 sq.km with an average population density of 185 persons/hectare. The average rate of sewage flow is 350 LCPD. The maximum flow is 50% in excess of the average sewage flow. The rainfall equivalent of 12 mm in 24 h can be considered for design, all of which is contributing to surface runoff. What will be the discharge in the sewer ? Find the diameter of the sewer if running full at maximum discharge. 6

Or

A town has a population of 100,000 persons with a per capita water supply of 200 litres per day of which 80% of it appears as sewage. Design a sewer running 0.7 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 500. Take a peak factor of 3. 6

6. What is the difference between disinfection and sterilization ? Why is disinfection necessary ? Explain break point chlorination. 10

Or

Discuss with the help of diagrams, various methods of laying out the distribution system. 10