Total No. of printed pages = 8

CT-506/EE/5th Sem/2017/N

ENVIRONMENTAL ENGINEERING

Full Marks – 70

Pass Marks – 28

Time – Three hours

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

PART – A

Marks – 25

All the questions are compulsory.

1. Choose the correct answer from the given options : $1 \times 25 = 25$

   (i) B.O.D. of treated water should be

   (a) 10 ppm (b) 25 ppm

   (c) 20 ppm (d) Nil.

   (ii) The chloride content of treated water for public supplies should not exceed

   (a) 100 ppm (b) 150 ppm

   (c) 200 ppm (d) 250 ppm.

[Turn over

(iii) Water gets evaporated from water surfaces and land surfaces, get converted into water drops at lower temperatures, flows over ground surface and finally meets its source, i.e. lake, sea, etc. This entire process is generally known as

(a) Hydrological cycle

(b) Water cycle

(c) Evaporation and precipitation cycle

(d) All of the above.

(iv) In rapid sand filters the ratio of length to diameter of the lateral, should not exceed

(a) 10 (b) 15

(c) 60 (d) 40

(v) Disinfection of drinking water, is done to remove

(a) odour (b) bacteria

(c) turbidity (d) colour.

(vi) Permanent hardness of water can be removed by

(a) adding alum (b) adding lime

(c) adding chlorine (d) zeolite process.

(vii) The permissible amount of nitrites present in potable water, is

(a) 10 ppm (b) 15 ppm

(c) 45 ppm (d) Nil.

(viii) The total domestic consumption in a city water supply, is assumed

(a) 20% (b) 30%

(c) 40% (d) 60%

(ix) Most important source of water for public water supply, is from

(a) lakes (b) ponds

(c) streams (d) rivers.

(x) For a city developed haphazardly, the layout of distribution pipes preferred to, is

(a) Ring system (b) Radial system

(c) Grid iron system (d) Dead end system.

(xi) The pH value of water fit for drinking, is

(a) 13 (b) 11

(c) 9 (d) 7

(xii) Dissolved carbon dioxide can be removed from the supply main by

(a) sedimentation (b) aeration

(c) chlorination (d) coagulation.

(xiii) The temporary hardness of water can be removed by

(a) boiling (b) adding charcoal

(c) adding alum (d) filtration.

(xiv) The period of cleaning of a slow sand filter, is usually

(a) 5 to 10 days

(b) two weeks to three weeks

(c) one month to three months

(d) three months to six months.

(xv) De-chlorination is followed by

(a) Post-chlorination

(b) Pre-chlorination

(c) Double-chlorination

(d) Super-chlorination.

(xvi) Maximum permissible colour for domestic water supplies, based on Cobalt scale, is

(a) 5 P.P.M. (b) 10 P.P.M.

(c) 15 P.P.M. (d) 20 P.P.M.

(xvii) The factor affecting per capita demand, is

(a) size of the city

(b) climatic conditions

(c) pressure in water mains

(d) All of the above.

(xviii) During treatment of water, sedimentation is done

(a) before filtration

(b) after filtration

(c) simultaneously with filtration

(d) along with chlorination.

(xix) Distribution of wash water is provided in

(a) Sedimentation tank

(b) Slow sand filter

(c) Rapid gravity filter

(d) All of the above.

(xx) The standard B.O.D. at 20°C, is taken for the consumption in

(a) 2 days (b) 3 days

(c) 4 days (d) 5 days.

(xxi) By boiling water, hardness can be removed if it is due to

(a) Calcium sulphate (b) Magnesium sulphate

(c) Calcium nitrate (d) Calcium bicarbonate.

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

(a) 10.25 mg/litre (b) 12.25 mg/litre

(c) 14.25 mg/litre (d) 16.25 mg/litre.

(xxiii) Blue baby syndrome is caused by the contamination of water due to

(a) Nitrates (b) Phosphates

(c) Arsenic (d) Sulphur.

(xxiv) 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.

(xxv) If discharge of a pump is 0.16 cumecs, the economic diameter of pipe, is

(a) 0.488 m (b) 4.88 cm

(c) 48.8 cm (d) 4.88 m.

PART – B

All the questions are compulsory.

2. Describe in brief the various tests conducted for the physical and chemical examination of water. 10

Or

Design a rapid sand filter, for a town having a total filtered water requirement of 10 million litres of water per day. Assume 30 minutes is lost everyday in backwashing of the filter and 3% of filtered water is used for the washing of filter everyday. 10

3. (i) For a small town having projected population of 40,000 residing over an area of 30 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. 5

(ii) Describe in brief the various types of water carriage system, stating advantage and disadvantage of each. 5

Or

With the neat sketch, explain the function and operation of slow sand filter. 10

4. Find the self-cleansing velocity and gradient required to transport coarse sand through a sewer of 60 cm diameter with the sand particle of 1mm diameter and specific gravity 2.66, assume β as 0.06, $f = 0.03$, the sewer is running half full. Take $N = 0.025$. 5

Or

Explain the various layout of water distribution system. 5

5. (i) Find the settling velocity of silica particle of specific gravity 2.67 in water at 25°C. If the diameter of particle is 0.004 cm, kinematic viscosity 0.009 cm^2 / sec. 5

(ii) Write a note on Break point chlorination. 5

6. (i) Explain the various treatment processes that are generally adopted in water treatment plant. 6

(ii) State the factors on which the storm water flow on an area depends. 4