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BINA CHOWDHURY CENTRAL LIBRARY
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Azara, Hatkhowapara,
Guwahati -781017

2022

B.Tech. 5th Semester End-Term Examination

Civil Engineering

ENVIRONMENTAL ENGINEERING - I

(New Regulation & New Syllabus)

Full Marks – 70

Time – Three hours

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

Answer Question No. 1 and any *Four* from the rest.

1. Answer the following:

(10 × 1 = 10)

- (i) Limitation of chloride content in drinking water is –
- (a) 300 mg/l
 - (b) 350 mg/l
 - (c) 200 mg/l
 - (d) 250 mg/l
- (ii) The limitation of pathogen in drinking water is
- (a) 0 per lit
 - (b) 10 per lit
 - (c) 100 per lit
 - (d) 1 per lit
- (iii) The point at which this free chlorine begins to form is called
- (a) Breakpoint chlorination
 - (b) Super chlorination
 - (c) De chlorination
 - (d) Residual chlorine

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- (iv) Detention time for a settling tank is
- (a) Volume of the tank/Rate of flow
 - (b) Rate of flow/Volume of the tank
 - (c) Volume of the tank \times Rate of flow
 - (d) None of these
- (v) Rate of filtration of rapid sand filter is
- (a) 12.50 m³/m²/d
 - (b) 125.00 m³/m²/d
 - (c) 1.25 m³/m²/d
 - (d) 1250.00 m³/m²/d
- (vi) The BOD₅ in ppm is given by the relation
- (a) BOD₅ = Loss of Oxygen / Dilution Factor
 - (b) BOD₅ = Loss of Oxygen \times Dilution Factor
 - (c) BOD₅ = Dilution Factor / Loss of Oxygen
 - (d) None of these
- (vii) In unconfined aquifer
- (a) Water table is the upper surface of the zone of saturation
 - (b) When a well is drilled or dug into a homogeneous aquifer, the water table initially is horizontal in the well
 - (c) Both option 1 and option 2
 - (d) None of these
- (viii) Physical Treatment Processes of water is/are
- (a) Screening and straining
 - (b) Adsorption
 - (c) Fixed film system
 - (d) All of these
- (ix) Ground water source is
- (a) Water from rivers
 - (b) Rain water collected from roofs
 - (c) Water collected from impounding reservoirs
 - (d) Water from shallow well
- (x) Composition of air is taken as
- (a) Nitrogen about 78% by volume
 - (b) Oxygen about 21% by volume
 - (c) Carbon dioxide about 0.04% by volume
 - (d) None of these

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2. Explain logistic curve method of population forecasting? The population statistics pertaining to a town are given below. Estimate the population expected in the year 2020 by Geometrical and incremental increase method: (5+10=15)

Year	1960	1970	1980	1990	2000
Population	70,000	1,00,000	1,10,000	1,50,000	2,10,000

3. (a) Explain the significance of the following from the point of view of water quality criteria: (5×2=10)

- (i) Turbidity
- (ii) Chlorides
- (iii) Nitrates
- (iv) Sulphates
- (v) Iron

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- (b) Explain the importance of chemical parameters in water used for domestic purposes. (5)

4. (a) What are the design criteria for selection of a intake structure? Describe about the river intakes. (3+4=7)

- (b) What are the different pipe networking systems? A pipe line 0.75 m diameter is 3 km long. As per demand of the higher discharge, another pipe line of same diameter is introduced parallel to the first in second half of its length. Find percentage the increase in discharge. Take $f = 0.04$ and head at the inlet as 48 m. (4+4=8)

5. (a) How the leakages can be detected of a pipe line?

A Pipe section AB is comprised of three components in a straight line:

AC	1200 mm long	400 mm dia
CD	400 mm long	300 mm dia
DB	400 mm long	200 mm dia

Determine the theoretical diameter of a single 2000 m. long pipe from A to B that would be equivalent to the series pipe line. (3+7=10)

- (b) Find out the pH of a mixture formed by mixing the following two solutions:

Solution 1 : volume 400 ml; pH = 8

Solution 2 : volume 600 ml; pH = 4

(5)

6. (a) A 20.0 ml sample of water mixed with dilution water to fill the BOD bottle of 300 ml was found to have an initial DO of 7.0 mg/l; and after 5 days of incubation its DO was 4.5 mg/l. Compute its BOD_5 at 20°C. (5)
- (b) Compute ultimate BOD (first stage), and 20-day BOD for the sample having BOD_5 at 20°C of 100 mg/l. Assume the value of K as 0.23 per day. (5)
- (c) A 20 cm diameter well was drilled 20 meter below the static water table. In two observation, wells at a distance of 80 m and 35 m from the Centre of well, the water level was found to be lowered by 50 cm and 110 cm respectively at a discharge of 6000 litres/minute in 24 hours. Calculate the transmissibility of aquifer. (5)

7. Short notes (*Any five*)

- (a) Infiltration galleries
- (b) Determination of alkalinity of water
- (c) Indicator organism
- (d) Different types of pipes
- (e) Principal components of a Rapid sand filter
- (f) Type I and Type II settling of suspended particles
- (g) Point Source and Non-Point Source.

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(5×3=15)