53 (CE-404) EVEN

2017

ENVIRONMENTAL ENGG.-I

Paper : CE-404

Full Marks : 100

Time : Three hours

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

*Answer **any five** questions.*

1. *(a)* Name the different types of pumps used generally in water supply scheme. What are the factors on which their selection depends ? 5

   (b) Describe in brief various tests conduct for physical examination of water. 15

2. *(a)* Two primary settling tank are 26m in diameter with a 2·1m size water depth for a water flow of 26,000 m^3/d

Calculate : 8

(i) Surface area and volume

(ii) Overflow rate in $m^3/m^2/day$

(iii) Detention time in hours.

(b) Draw a neat sketch of a slow sand filter and describe how it works. 12

3. *(a)* Illustrate with sketches, the different types of layout of pipe systems in distributing water and compare their comparative merits and demerits. 12

(b) From a clear water reservoir 3m deep and maximum water level at 30·00m, water is to be pumped to an elevated reservoir at 75·00 at the constant rate of 9,00,000 litres per hour. The distance is 1500m. Give the economical diameter of the rising main and the total head losses of the pump. Take f=0·04. 8

4. *(a)* Discuss briefly the various methods which are adopted collectively for treating public water supplies drawn from a Perennial river. 10

(b) Explain briefly the significance of the following from the point of view of water quality criteria. 10

(i) Breakpoint Chlorination

(ii) Optimum dose of coagulant

5. *(a)* Design a rapid sand filter unit for 4 million litres per day of supply with all its principal components. Assume 4% of filtered water is required for washing of filter every day and 30 minutes lost everyday in washing the filter. 15

(b) Find the settling velocity of a discrete particle in water under conditions when Reynold's number is less than 0·5, the diameter and specific gravity of the particle is $0{\cdot}05mm$ and $2{\cdot}65$ respectively, water temperature is $20°C$, kinematic viscosity ν of water at $20°C = 1{\cdot}01 \times 10^{-2} Cm^2/sec$. 5

6. *(a)* The maximum daily demand at a water purification plant has been estimated as 42 million litres per day. Design the dimensions of a suitable sedimentation tank for the raw supplies. Assuming a detention period of 8 hours and the velocity of flow as 30 *cm* per minute. 8

(b) Derive the Stoke's law, for finding the settling velocity of a discrete particle under the condition Reynold's no. less than 0·5. 8

(c) Assuming a linear variation of pH with time, determine the average pH value of water, when the pH of incoming and outgoing water are of 7·2 and 8·4 respectively in water treatment plant. 4