53 (CE 404) ENVE-I

2016

ENVIRONMENTAL ENGINEERING–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)* Derive an expression for determination of permeability in a well with unconfined aquifer. 8

   (b) For conducting permeability test on a well which has an unconfined aquifer, two observation wells *A* and *B* are bored at distance 15*m* and 30*m* respectively from the centre of the well. When water is pumped at the rate of 5 litres per second, it is observed that the elevations of the water table above the impervious layer up to which the well is excavated are 12*m* and 12·5*m* respectively at *A* and *B*. Calculate the permeability of the aquifer in *m*/day. 6

(c) Draw the layout of a water treatment plant of a city with river as the source. Label various units. 6

2. (a) Enumerate the causes for wastage of water in public water supplies. Describe briefly methods for their prevention. 8

(b) Explain briefly the various methods of forecasting the future population of a city. Discuss their relatively merits. 12

3. (a) A rectangular sedimentation basin is to handle 10 million litre/day of raw water. A detention basin of width to length ratio of 1/3 is proposed to trap all the impurities larger than 0·04*mm* in size. Assuming a relative density of 2·65 for the particles and 20°*C* as the average temperature, compute *(i)* Basin dimensions *(ii)* Detention time if the depth of tank is 3·5*m*. 12

(b) Compare a rapid sand filter with a slow sand filter in respect of following features : Rate of filtration, size of bed, in efficiency, period of cleaning. 8

4. *(a)* What is meant by pH value ? How is it determined ? What is its importance in water analysis ? 10

(b) Water has to be supplied to a town with 1 lakh population at the rate of 150*l*/capita/day from a river 2000*m* away. The difference in elevation between the lowest water level in the sump and the reservoir is 36*m* if the demand has to be supplied in 8 hours. Determine the size of the mains and brake horse power of the pumps required. Assume maximum demand as 1·5 times the average demand. Assume $f = 0{\cdot}03$, velocity in the pipe 2·4*m*/*sec*, and efficiency of pump 80 per cent. 10

5. *(a)* What is meant by disinfection in treating public water supply ? What is its importance ? What are the chemicals which are used as disinfectant ? 10

(b) Discuss the various methods which are adopted for treating public supplies in order to remove colour and taste from it. 10

6. *(a)* Design the approximate dimensions of a set of rapid sand filter for treating water required for the population of 90,000, the rate of supply being 180 litres/day/person. The filters are rated to work 6000 litres/*hr*/*sq.m.* Assume max water demand per day is 1·8 times the average daily demand. 8

(b) Explain briefly the following : 12

(i) Break point chlorination

(ii) Coagulation