Printed Pages—4 **ECE602**

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2455 Roll No. | | | | | | | | | | |

B. Tech.

(SEM. VI) THEORY EXAMINATION 2010-11

ENVIRONMENTAL ENGG.-2

Time : 3 Hours *Total Marks : 100*

Note : Attempt **ALL** questions. Assume any missing data suitably.

1. Attempt any **four** parts of the following :

   (a) What is alkalinity ? What are most common constituents of alkalinity in water ? 5

   (b) What are source and impacts of nitrate in water supplies ? 5

   (c) Give the maximum acceptable limits of turbidity, colour, Hardness and pH in drinking water. 5

   (d) What is an indicator organism ? Discuss the characteristics of an ideal pathogen indicator. 5

   (e) Define non biodegradable organics. Discuss their sources.

   (f) What size of sample expressed as a percent is required if the 5-day BOD is 400 mg/l and the total oxygen consumed in the BOD Bottle is limited to 2 mg/L ? 5

2. Attempt any **two** parts of the following : **(10×2=20)**

(a) A column analysis of a flocculating suspension is run in laboratory. The initial solid concentration is 250 mg/*l*. The resulting matrix is shown below. What will be the overall removal efficiency of a settling basin which is 3m deep with a detention time of 1 hr and 45 min ?

Depth (m)	Time of sampling, min					
	30	60	90	120	150	180
0.5	133	83	50	38	30	23
1.0	180	125	93	65	55	43
1.5	203	150	118	93	70	58
2.0	213	168	135	110	90	70
2.5	220	180	145	123	103	80
3.0	225	188	155	133	113	95

The results of suspended solids is expressed in mg/L. 10

(b) A water treatment plant is being designed to process 50,000 m^3/d of water. Jar testing and pilot plant analysis indicate that an alumn dosage of 40 mg/L with flocculation at a 'Gt' value of 4×10^4 produce optimal results at the expected water temperature of 15°C. Determine :

(i) Monthly Alum requirement 3

(ii) The flocculation basin dimension if three cross flow horizontal paddles are to be used. The flocculator should be max of 12m wide and 5m deep in order to connect with settling basin. 5

(iii) The power requirement. 2

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(c) (i) Define type I of Type II settling. 4

(ii) Name any two trivalent metallic salts which are used as coagulant in water treatment plants. 2

(iii) Define rapid mixing and flocculation. 4

3. Attempt any **two** parts of the following :

(a) Clean water at 20°C is passed through a uniform sand at filtering velocity of 5.0hm/n (1.39×10^{-3} m/s). The sand grains are 0.4 mm in diameter with shape factor of 0.85 and specific gravity of 2.65. The depth of the bed is 0.67 m and porosity is 0.4. Determine the head loss through bed. Take $\rho = 998.2$ kg/m^3 and $\mu = 1.002 \times 10^{-3}$ N.s/m^2. 10

(b) Explain back washing in rapid sand filter. Discuss its principal mechanisms of filtration. 10

(c) Describe the characteristics of a good disinfectant and describe the effect of pH during chlorination. 10

4. Attempt any **two** parts of the following:

(a) (i) Draw a typical bacterial growth curve and discuss various phases involved in bacterial growth. 6

(ii) Define Bulking of sludge and discuss role of F/M ratio in Activated sludge process. 4

(b) (i) Discuss the process microbiology involved in the trickling filter. Write down NRC and Eckefelder's equation for trickling filter. 6

(ii) What is roughing filter ? When it is used ? 4

(c) Design a facultative stabilisation pond to treat 5000 m^3/d municipal waste water, BOD_5 =230 mg/l from a town (population 25000 person) located in Central India latitude 22°N, elevation 100 m above sea level. The average temperature in January is 18°C. The effluent from pond to be used for irrigation. Assume any data if required. 10

5. Answer any **four** of the following :

(a) Describe the process microbiology involved in an Anaerobic Process. 5

(b) Give detail of a high rate anaerobic digester. 5

(c) What is UASBR ? Discuss its features. 5

(d) What is sludge thickening ? Give detail of gravity thickening. 5

(e) Differentiate between anaerobic fixed bed reactor, fluidized bed reactor and expanded bed reactors. 5

(f) Write down the values of following parameters in waste water being disposed in rivers :

(i) BOD

(ii) COD 5