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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 2011-12

ENVIRONMENTAL ENGINEERING—II

Time : 3 Hours *Total Marks : 100*

Note : Attempt ***all*** questions and assume suitable value of parameters, if not given in questions.

1. Attempt any ***four*** of the following : **(4×5=20)**

   (a) How are the organic contents measured in waste water samples ? Discuss any one method in detail.

   (b) Discuss advantages and disadvantages of BOD and COD test.

   (c) What is the maximum permissible limit of nitrate in drinking water ? Also discuss the detrimental effects of excess nitrate.

   (d) What is M.P.N. ? How it is measured ?

   (e) What is Theoretical Oxygen Demand (ThOD) ? Determine the ThOD for Glycine ($CH_2(NH_2)COOH$).

   (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* ?

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

   (a) Define :

      (i) Discrete Particles

(ii) Flocculating Particles

(iii) Dilute Suspension

(iv) Concentrated Suspension.

(b) Describe the four functional zones of long-rectangular settling tank.

(c) Name and discuss the four mechanisms thought to occur during coagulation.

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

(a) A rapid sand filter has a bed depth of 0.7 m. It is composed of sand grains that have a specific gravity of 2.65 and shape factor of 0.82. The porosity of the bed is 0.45 throughout. The sieve analysis of the sand is shown below :

Sieve No.	Mass retained (%)	Average particle size mm
1	0.87	1.0
2	8.63	0.71
3	21.30	0.54
4	28.10	0.46
5	23.64	0.38
6	7.09	0.32
7	3.19	0.27
8	2.16	0.23
9	1.02	0.18

Determine the head loss through the bed if the flow rate is 5.0 m/s and water temperature is 17°C.

(b) Design rapid gravity filter for producing a net filtered water flow of 250 m^3/hr. The relevant data is :

(i) Quantity of back wash water used = 3% of output

(ii) Time lost during back washing = 30 minutes

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(iii) Design rate of filtration = 5 $m^3/m^2/hr$

(iv) Length to width ratio = 1.25 – 1.33 : 1

(v) Under drainage system = central manifold

(vi) Size of perforations = 9 mm

(c) Design a secondary circular sedimentation tank to remove alum floc with following data :

(i) Average output from settling tank = 250 m^3/hr

(ii) Amount of water lost in desludging = 2%

(iii) Average design flow = 255.1 m^3/hr

(iv) Minimum size of alum floc to be removed = 0.8 mm

(v) Sp. gr. of alum floc = 1.002

(vi) Expected removal efficiency = 80%

(vii) Assumed performance of settling = very good (h = 1/8)

(viii) Kinematic viscosity of water at 20 °C = 1.01×10^{-6} m^2/s

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

(a) Design a facultative aerated lagoon to serve 40,000 people. For sewage flow @ 180 *l*pcd = 7200 cu.m/day. Raw BOD_5 = 277 mg/*l* and final BOD_5 is not to exceed 30 mg/*l* in winter. Average ambient air temperature in January is 18°C and in summer 37°C. 10

(b) Design a facultative stabilization pond to treat 5000 m^3/d municipal wastewater, BOD_5 230 mg/*l*, from a town (population 25,000 persons) located in Central India, latitude 22-N, elevation 100 m above sea level. The average temperature is 18°C. The effluent from the pond is to be used for irrigation. 10

(c) (i) Discuss various modifications of activated sludge process (ASP). Also explain role of F/M ratios in ASP. 5

(ii) Write and explain NRC's and Eckenfelder's equation for Trickling filter.

5. Answer any ***four*** of the following : **(4×5=20)**

(a) Write various steps involved in Anaerobic process. At which step the alkalinity will be maximum ?

(b) What are low rate and high rate anaerobic digesters ?

(c) What is UASBR ? Draw a schematic diagram of a UASBR reactor.

(d) Write short notes on Duck weed pond.

(e) Discuss nutrients removal in wastewater a tertiary treatment.

(f) What is septic tank ? Discuss advantages and disadvantages of centralized *vs.* decentralized wastewater treatment.