

M.Tech Even Semester (CBCS) Exam., April—2017

AGRICULTURAL ENGINEERING

( Water Resource Development and Management)

( 2nd Semester )

Course No. : MAEEL-03

( Water Quality Management )

Full Marks : 50

Pass Marks : 15

Time : 2 hours

Note : 1. Attempt any **five** questions.

2. Begin each answer in a new page.

3. Answer parts of a question at a place.

4. Assume reasonable data wherever required.

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

1. (a) Design a bar screen chamber for average sewage flow of 20 MLD. Use Kirchmer's equation for head loss calculation. Make necessary logical assumptions wherever necessary. 8

(b) Name different types of filtration processes. 2

2. (a) Write a short note on various types of settling processes along with a diagram. 5

(b) Design a rectangular sedimentation tank to treat 2.4 million litres of raw water per day. The detention period may be assumed to be 3 hours. 3

(c) What is the purpose of incorporation of equalization process for industrial wastewater treatment? 2

3. (a) Wastewater flow  $0.38 \text{ m}^3/\text{min}$  with  $0.1 \text{ N H}_2\text{SO}_4$  requires neutralization to a pH of 7.0 using a limestone bed. Assume limestone is 60% reactive. Hydraulic loadings to get pH of 7.0 with depth of limestone bed are estimated from laboratory studies and results are furnished in the table below :

Depth (m)	Hydraulic loading, ( $\text{m}^3/\text{m}^2\text{-hr}$ )
0.152	1.709
0.305	7.326
0.610	34.595
0.915	58.608
1.220	65.120

Design neutralization system specifying—

(i) most economical bed depth of limestone;

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- (ii) weight of acid per day to be neutralized;  
(iii) limestone requirements on an annual basis. 7
- (b) Write a note on disinfection of water. 3
4. (a) Describe different mechanisms of coagulation. 4  
(b) What is zeta potential? Explain with diagram. 4  
(c) What do you mean by van der Waals' forces? 2
5. (a) The BOD of a sewage sample incubated for one day at 30 °C has been found to be 100 mg/L. What will be the five-day 20 °C BOD? Assume  $K = 0.12$  (base 10) at 20 °C and  $1.056$ . 4  
(b) What are different types of oxidation ponds? 6
6. (a) What do you mean by nitrification in BOD test? 4  
(b) Write a short note on trickling filter with diagram. 6

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7. (a) Explain the four-step selection processes for choosing a water quality model. 5  
(b) Explain the working of tanks-in-series models. 5
8. (a) What do you understand by model testing? Describe the method of model testing by comparison with analytical solutions. 2+3  
(b) Write the basic water quality model equation explaining each of the terms in it. 5

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