Uva Wellassa University of Sri Lanka
Faculty of Science and Technology
Department of Science and Technology
300 Level 2nd Semester Examination – January 2018
MRT 382-3 Water Treatment Methods

Uva Wellassa University

Instructions
Duration: 03 hours
Answer All Questions
Mark allocation: 100
Illustrate your answers with sketches/diagrams where necessary

Index Number:-

Part A
(02 Questions, Answer All, Total 50 Mark)

1. Assume that you are a process engineer and have been asked to design a water treatment process for a town of 20,000 families.

a. List out all the assumptions you make in the above calculations. Justify each assumption with the acceptable evidences. (07 mark)

b. Calculate the total extraction expected to be done at the intake. (08 mark)

c. Design the sedimentation tanks dimensions (width, length and height) based on the following guidelines.

Parameter	Design value
Surface loading rate ($m^3/m^2.d$)	20 - 60
Mean horizontal velocity (m/min)	0.15 - 0.90
Water depth (m)	2-3
Detention time (h)	2-4
Weir loading rate ($m^3/m.d$)	100 - 200
Solid loading rate ($kg/m^2.d$):	
+ Primary sedimentation	15 - 34
+ Secondary clarifier	49 - 98

(06 mark)

d. Calculate the width and length of filters. Assume filter media height as 1200 mm and they are packed on a concrete slab with air nozzles placed at equal distances.
Clue: Use the filtration rate as 150 $m^3/m^2/day$ (04 marks)

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21. What does MLVSS stands for?

22. Discuss briefly about the importance of screening process in water treatment.

23. Discuss about the possible groundwater contaminants in Sri Lanka.

24. What is the most important parameter to consider in wastewater treatment process?

25. What is CKDu? What are the possible causes?

-END-

Part B
(25 Questions, Answer All, Total 50 Mark)

1. What are the three steps followed in a jar test experiment in a water treatment plant laboratory?
2. Briefly describe the importance of pH correction in coagulation process.
3. Indicate the all possible chemical additions within a conventional water treatment facility in a logical order.
4. What is the general value of G for rapid mixer design?
5. What is the general surface loading rate design value of slow sand filters?
6. What is the standard filtration rate for a rapid sand filter?
7. What is the optimum backwash rate of rapid sand filters?
8. What is the optimum pH range of Aluminum Sulphate for better coagulation?
9. Explain the differences between colour and turbidity.
10. What are the five main stages used in a full-scale wastewater treatment process?
11. What is the expected range of residual chlorine (RCl) concentration to be maintained in a distribution system?
12. What are the four basic zones of a sedimentation basin?
13. What is the general design range for retention time (HRT) of sedimentation process?
14. What are the main four component of a wetland system?
15. Explain the function of coagulant aids.
16. What does UASB stands for?
17. What are the three base materials (raw materials) for activated carbon production?
18. What are the two basic forms of activated carbon available in the market?
19. Which is the best form of activated carbon to use in temporary contamination?
20. Describe the importance of having the correct post chlorination concentration.

2.

a. Discuss the wastewater characteristics and explain the necessity of treating wastewater. (05 mark)

b. Suggest an appropriate treatment train for wastewater treatment. (05 mark)

c. The influent water quality of a leading distillery company is given below. According to the water quality analysis, it has been identified that the present treatment process is not effective. Therefore, propose a suitable/missing treatment processes to overcome the above problems? (10 mark)

Influent water quality

pH	4.5
BOD (mg/l)	6,600
COD (mg/l)	25,000
Conductivity (µS/cm)	5,500

d. The values of Chemical Oxygen Demand (COD) and Biological Oxygen Demand(BOD) of waste water generated from a rice mill, where rice is being washed and collected are given below.

COD - 5000 mg/L

BOD - 200 mg/L

Discuss on designing a suitable wastewater treatment process for the above effluent. (05 mark)