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Roll No.

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Odd Semester Examination, 2019-20

B. Tech: Civil (5<sup>th</sup> Semester)

Environment Engineering II

Time: 3:00hr

M.M:100

Total no. of printed pages: 2

Note : (i) Attempt ALL questions.

(ii) In case of numerical problems assume data whenever not provided.

Q1. Attempt any four of the following

11

4X5=20

- (a) Define the following terms: 3  
Refuse, Garbage, Sewer, Sewage, sewerage system and Night soil.
- (b) What do you understand by dry weather flow and storm water flow? Discuss in brief, the factors affecting dry weather flow. 3
- (c) A mixed liquor with 1500 mg/L of suspended solids has the settled volume of 200 ml from a litre of this mixed liquor. Calculate its sludge volume index (SVI). Is it safe or not?
- (d) What is grit? Why should grit be removed from wastewater? Mention the design criteria of grit chambers. 3
- (e) Say a raw wastewater sample from wastewater treatment plant has 500 mg/L 5-day BOD at 20°C (due to carbon only) with reaction constant ( $k = 0.23$  per day at 20°C). Calculate ultimate BOD at 20°C and 30°C respectively. Mention the comment on observed values of ultimate BOD.
- (f) What is screening? And briefly explain their types. 2

Q2. Attempt any four of the following

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4X5=20

- (a) Write short notes on UASB process. 2
- (b) Draw the flow diagram showing sequence of various treatment units of a typical wastewater treatment plant. Label these treatment units sequentially. 3
- (c) Briefly discuss about the physical and chemical characteristics of sewage. 2
- (d) What is self cleansing velocity? Explain its importance in the design of sewer.
- (e) Define hydraulically efficient section. Find the relation between two hydraulically efficient sections for a square section of one sewer (width  $b$ ) and the diameter of a circular section of another sewer (diameter  $d$ ).
- (f) Write the various relations for estimating the storm water flow in the sewer. 3

Q3. Attempt any two of the following

11

2x10=20

- (a) Discuss the design criteria of circular sewer. Write the generalize expression for the hydraulic characteristics of a circular sewer sections running partially full. 6
- (b) Design a circular sewer running half full at a flow rate of 500 litres per second and laid at an invert slope of 00001. Use manning's equation and coefficient  $\eta = 0.015$ .
- (c) Describe various types of water carriage system. Mention the advantages and disadvantages of each system. 5

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12

2x10=20

Q4. Attempt any two of the following

- (a) Discuss the process of aerobic and anaerobic wastewater treatment. Explain the different methods for aerobic process in biological treatment. 6
- (b) Determine the dimensions of a high rate trickling filter for the following data:  
(a) Sewage flow = 2.5 MLD (b) Recirculation ratio = 1.5  
(c) BOD of raw sewage = 250 mg/L (d) BOD removed in primary tank = 25%  
(e) Final effluent BOD desired = 30 mg/L.  
By what percentage the diameter of the filter will have to be changed if it is to be designed as a standard rate trickling filter for the above dataset.
- (c) Explain attached growth system and Suspended growth system with suitable example. Mention the operational difficulties in an activated sludge process? Explain each of them. 6

Q5. Attempt any two of the following

6

2x10=20

- (a) Classify the solid waste with suitable example. Also explain the different methods of disposal of solid wastes. 5
- (b) Design a septic tank for 400 persons with a water supply of 125 litres per capita per day. Assume any data suitably and mention it. If percolation rate is 15 minute, find the effective percolation area required.
- (c) Population of a town is 20,000 with an assured water supply of 135 lpcd. BOD of the waste water is 150 mg/L. Design the most suitable waste treatment system (without power supply) for the town. 1