

(Please write your Exam Roll No.)

Exam Roll No. 00218008413

# END TERM EXAMINATION

FIFTH SEMESTER [B.TECH.] DECEMBER 2015-JANUARY- 2016

Paper Code: ETCE-311

Subject: Wastewater Engineering & Reuse

Time: 3 Hours

Maximum Marks: 75

Note: Attempt any five questions including Q.No1, which is compulsory. Select two questions each from section A and Section B. Assume suitable missing data.

- Q1
- (a) What are the advantages and limitations of disposal of sewage on land. (6)
  - (b) State the function of detritus and skimming tanks. (4)
  - (c) Explain the different types of surface aerators. (5)
  - (d) State the uses and limitations of interceptors in plumbing systems. (5)
  - (e) What is the difference between oxidation pond and oxidation ditch? What are their principles of operation? (5)

## SECTION-A

Attempt any two question:-

- Q2
- A main combined sewer was designed to serve an area of 60 km<sup>2</sup> with an average population of 185 persons/hectare. The average rate of sewage flow is 180 litres/capita/day. Maximum flow is 50% in excess of the average together with the rainfall equivalent of 12mm. in 24hrs, all of which are runoff. what should be the capacity of sewer? Find the minimum velocity and gradient required to transport coarse sand through a sewer of 40cm diameter with sand particles of 1mm diameter roughness coefficient (n) for sewer material may be assumed as 0.013. (12.5)

- Q3
- A town having a population of 30000 persons is producing the following sewages:- (12.5)
- (i) Domestic sewage @ 120 lpcd having 200 mg/L of BOD.
  - (ii) Industrial sewage @ 300000 lpd having 800 mg/L of BOD.
- Design a high rate single stage trickling filter for treating the above sewage. Assume that the primary sedimentation removes 35% of BOD. Allow an organic loading of 10000kg/ha. m/day (excluding recirculated sewage). The recirculation ratio is 1.0 and the surface loading should not exceed 170ML/ha/day (including recirculated sewage). Also determine the efficiency of the filter and the BOD of the effluent.

- Q4
- Design the aeration and sedimentation tank of domestic sewage with diffused air aeration system, given: (12.5)
- Population=40000  
Average sewage flow=160 lpcd  
BOD of sewage=220 mg/L  
BOD removed in primary treatment=30%  
Overall BOD reduction desired=85%

## SECTION-B

Attempt any two question:-

- Q5
- (a) What are the different methods of collection of sewage samples? What are the methods for prevention of sewage sickness? (6)
  - (b) Using a diagram, explain the sulphur cycle under aerobic oxidation. (6.5)
- Q6
- (a) State the principle of operation and design features of RBC. (6)
  - (b) What are the advantages and disadvantages of using septic tanks? (6.5)
- Q7
- (a) Define the terms MLSS, MLVSS and SVI. How is the test for determination of SVI carried out? (6.5)
  - (b) Differentiate between plug flow and complete mixed flow. State the limitations of conventional Activated Sludge Process. (6)
- Q8
- (a) What are the different forces acting on sewer pipes? Explain. (4)
  - (b) What are the functions of manholes, catch basins and grease & oil traps? (4.5)
  - (c) What are traps? What are the different categories based on their shapes? (4)

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