Reg. No.										

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

I SEMESTER M.TECH (ENVIRONMENTAL ENGINEERING)

END SEMESTER EXAMINATIONS, NOV/DEC 2015

SUBJECT: Advanced Water and Wastewater Engineering [CIE 521]

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ANY FIVE FULL** the questions.
- Missing data may be suitable assumed.

1A.	Discuss the objectives of biological treatment of wastewater. Explain unit operations and unit processes	**5**
1B.	Briefly discuss the importa11ce of fluctuations in the flow rate and pollutant mass loading on the design of wastewater treatment unit	**5**
2A.	Explain Suspended growth system and attached growth system	**4**
2B.	Write a note on Flocculent settling and hindered settling	**3**
2C.	With a neat sketch write a note on sludge digestion process.	**3**
3A.	It is proposed to construct a rectangular sedimentation tank for treating the sewage of a town to remove suspended solids with an average wastewater flow of 20,000 m^3/d. Determine the dimensions of rectangular tank with an overflow rate of 45 MLD and side water depth as 3 m. Assume L:B = 2.5:1. Take peak factor as 2.5	**5**
3B.	Explain with equations the design procedure of first and second stage trickling filter to treat the domestic wastewater of a town.	**5**
4A.	A town is having a sewage flow of20 MLD. Design an activated sludge process unit using the data given below: Sludge wasting flow (Qw) =120m^3/d Biomass concentration in the reactor (x) = 3,600 mg/l Returned sludge concentration (Xr) = 9,000 mg/l Hydraulic retention time (HRT) = 3.5 Hours *Compute:* i. Mean cell residence time ii. Recirculation ratio ... R, neglecting the effluent biomass iii. Volume of activated sludge process un it required.	**6**
4B.	What are the major problems encountered in ASP system.	**4**
5A.	Describe any two different types of membrane processes with their general characteristics and give one advantage of each	**5**
5B.	A municipal wastewater having a BOD of250 g/m^3 is to be treated by a two stage trickling filter. The desired effluent quality is 25 g/m^3 of BOD. If both of the filter depths are to be 1.83m and the recirculation ratio is 2: 1. Find the required trickling filter diameter. Data are given below:	**5**

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	Flow rate = 7570 m^3/d, wastewater temperature = 20°C and $E_1 = E_2 = 0.65$	
6A.	Derive an expression for finding critical DO deficit of a natural stream.	**5**
6B.	A wastewater of 5.0 m^3/sec is discharged into a river of flow 50 m^3/sec. The ultimate BOD of wastewater is 200 mg/l and DO is 1.5 mg/l. The river water has a BOD of 3 mg/l and DO 00 mg/l. The reaeration coefficient of the river water is 0.2/day and BOD decay coefficient is OA/day. The river has a cross-sectional area of 200 m^2 and the saturated DO concentration of the river water is 8 mg/l. i. At a downstream point of 10 km calculate the DO of the mixture. ii. At which point the DO is a bare minimum.	**5**