

Name :  
Reg No :



APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY  
07 THRISSUR CLUSTER

**FIRST SEMESTER M.TECH. DEGREE EXAMINATION DEC 2017**

**Civil Engineering Department**

**Environmental Engineering**

**07CE6105 PHYSICO CHEMICAL METHODS IN ENVIRONMENTAL  
ENGINEERING**

**Time : 3 hours**

**Max.Marks: 60**

Answer all six questions. Part 'a' of each question is compulsory.

Answer either part 'b' or part 'c' of each question

**Q.no. Module 1 Marks**

**1a** Explain the different types of reactions with suitable examples.

**4**

**Answer b or c**

**b** Derive the mass balance analysis of an Ideal Plug Flow Reactor

**5**

**c** Determine the reaction order and reaction rate coefficient for the following data

**5**

Time(days)	0	1	2	3	4	5	6	7	8
Concentration(mole/l)	250	70	42	30	23	18	16	13	12

**Q.no. Module 2 Marks**

**2a** Explain briefly the different types of bar screens

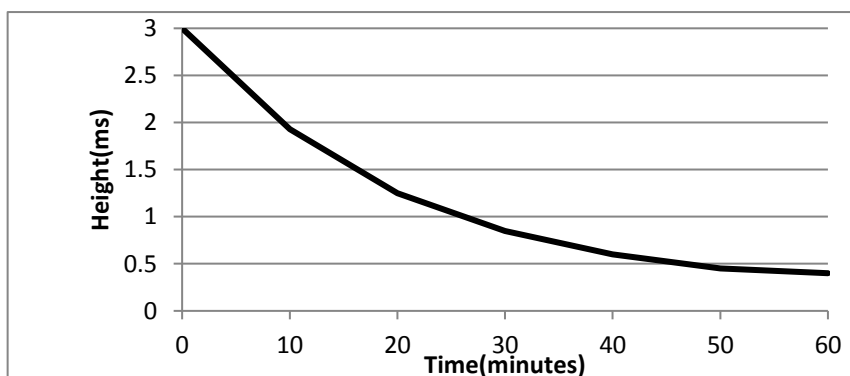
**4**

**Answer b or c**

**b** Explain the different types of equalization process with flow diagrams. How will you calculate the capacity of an equalization basin?

**5**

**c** The following curve was obtained from a settling test data in a 3m cylinder. The initial solids concentration was 3600 mg/l. Determine the thickener area required for a concentration  $C_u$  of 12000 mg/l with a solids flow 1500 m<sup>3</sup>/day



Q.no.	Module 3	Marks
3a	Explain lamella plate clarification with a neat sketch	4

**Answer b or c**

- b** Determine the settling velocities of ballasted floc, spherical and wastewater particles having the following characteristics **5**

parameter	Particle type		
Average dia in $\mu\text{m}$	200	150	500
Particle sp.gravity	2.6	2.65	1.0035
Shape factor	2.5	1	1.8
Wastewater Sp. gr	1.003	1.003	1.003

- c** Determine the theoretical power requirement and the paddle area required to achieve a G value of 50/S in a tank with a volume of 3000 m<sup>3</sup>. Assume the water temp is 15°C,  $C_D$  is 1.8, paddle tip velocity  $v$  is 0.6 m/s and relative velocity of paddles  $v_p$  is 0.75 times  $v$  **5**

Q.no.	Module 4	Marks
4a	Explain the different factors influencing the disinfection process.	4

**Answer b or c**

- b** Determine the headloss through a 600 mm sand bed composed of spherical, unisized sand with a dia of 0.55 mm, porosity of sand is 0.4, filtration velocity is 240 L/m<sup>2</sup>-min Kinematic viscosity is  $1.306 \times 10^{-6} \text{ m}^2/\text{s}$  **5**
- c** Discuss the various problems in filters and how can they solved? **5**

Q.no.	Module 5	Marks
5a	Explain the chemistry of chlorination process.	5

**Answer b or c**

- b** Estimate the daily required Cl<sub>2</sub> dosage and the resulting build up of TDS when Break point chlorination is used for the seasonal control of N<sub>2</sub>. Assume the following data. **7**

Plant flow rate= 38 m<sup>3</sup>/day

Effluent characteristics { BOD<sub>5</sub>= 2 mg/l, TSS= 25 mg/l, NH<sub>3</sub>-N= 23 mg/l

Required effluent NH<sub>3</sub>-N= 1 mg/l

- c** Explain the various advanced Oxidation process in detail **7**

<b>Q.no.</b>	<b>Module 6</b>	<b>Marks</b>
<b>6a</b>	Explain the theory of electrodialysis process	<b>5</b>
<b>Answer b or c</b>		
<b>b</b>	Determine the flux rate coefficient and mass transfer coefficient for the given data  Flowrate of feed stream 5500 m <sup>3</sup> /day Influent TDS= 3300 g/m <sup>3</sup> ;    Effluent TDs= 500 g/m <sup>3</sup> Net operating pressure= 2500 KPa	<b>7</b>
<b>c</b>	Give the advantages and disadvantages of Reverse Osmosis process	<b>7</b>

(Note: The sub question 'a' will be compulsory one, testing the knowledge on fundamental aspects. Parts 'b' and 'c' shall preferably be application type questions with the choice to answer any one.)