Reg.No.										

VII SEMESTER B.TECH. (CHEMICAL ENGINEERING)

SUBJECT: PE – VI : INDUSTRIAL WASTEWATER ENGINEERING

[CHE 4006]

MAKEUP EXAMINATION

REVISED CREDIT SYSTEM

Date: 2/01/2019 **Time: 2 – 5 PM** **MAX. MARKS: 50**

Instructions to Candidates:

- **Answer ALL the questions.**
- **Missing data may be suitably assumed.**

<table>
<tr><td>1A</td><td>The wastewater has a BOD_5 equal to 180 mg/l and a reaction rate k equal to 0.22/day. It also has a Total Kjeldahl Nitrogen content (TKN) of 30 mg/l.
(i)Find the ultimate carbonaceous oxygen demand (CBOD)
(ii)Find the ultimate nitrogenous oxygen demand (NBOD)
(iii)Find the remaining BOD after 5 days have elapsed.</td><td>(5)</td></tr>
<tr><td>1B</td><td>A mechanically cleaned bar screen has bars of 8 mm thick and 30 mm clear spaces between the bars. If the flow rate is 0.20 m^3/s, velocity through the bars is 0.90 m/s, determine the approach velocity, head loss through the screen and effective cross sectional area.</td><td>(5)</td></tr>
<tr><td>2A</td><td>The data of wastewater generated by a community on an hourly basis is recorded as shown in table below. Determine the volume of an equalization tank for the treatment plant
<table>
<tr><td>Time(hr)</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td></tr>
<tr><td>Flow (m^3/min)</td><td>2.0</td><td>7.2</td><td>7.5</td><td>6.7</td><td>8.3</td><td>9.3</td><td>20.0</td><td>25.0</td><td>31.0</td><td>27.5</td><td>24.0</td><td>20.0</td></tr>
<tr><td>Time(hr)</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td><td>22</td><td>23</td><td>24</td></tr>
<tr><td>Flow (m^3/min)</td><td>21.0</td><td>19.0</td><td>15.0</td><td>10.0</td><td>6.5</td><td>7.6</td><td>7.2</td><td>6.8</td><td>5.5</td><td>4.5</td><td>3.5</td><td>3.0</td></tr>
</table></td><td>(7)</td></tr>
<tr><td>2B</td><td>A conventional activated sludge process plant is in operation with a θ_c of 10 days. Reactor volume = 8000 m^3, MLSS = 3000 mg/l.
Determine
(i)Sludge wastage flow rate when wasting from the reactor
(ii)Sludge wastage flow rate when wasting from the recycle line.
Assume concentration of suspended solids in the recycle line as 10000 mg/l</td><td>(3)</td></tr>
<tr><td>3A.</td><td>Design a biodisc for 600 persons to remove 90% of BOD of 170 mg/l at the rate of 160 lpcd.Assume loading rate as 10 g/m3.day and volume of the tank as 40 m3. Make the necessary check for efficiency using Ka as 2.3</td><td>(5)</td></tr>
</table>

3B.	Design a high rate trickling filter for a design flow of 1200 m3/day with an influent presettled BOD of 180 mg/lt. The effluent BOD after treatment not to exceed 20 mg/lt. Use Schulze equation, Rankine's equation and NRC equation for the design.	**(5)**
4A.	Explain the different unit operations used in wastewater treatment.	**(5)**
4B.	Explain any two types of high rate anaerobic reactors with a neat flow diagram.	**(5)**
5A.	Explain problems faced in ASP treatment process.	**(4)**
5B.	Explain the disinfection process for wastewater treatment and compare the advantages and disadvantages of using chlorine, ozone and UV for wastewater disinfection.	**(6)**

3A		**(15)**
3B		**(06)**
3C		**(10)**
4A		**(04)**
4B		**(07)**
4C		**(08)**
5A		**(05)**
5B		**(10)**
6A		**(10)**
6B		**(06)**
		(10)

6C		**(04)**