MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL (A constituent unit of MAHE, Manipal)

## IV SEMESTER B.TECH (CIVIL ENGINEERING) END SEMESTER EXAMINATIONS, JUNE 2022

SUBJECT: WASTEWATER MANAGEMENT [CIE 2254]

**REVISED CREDIT SYSTEM** 

( \_ / 06 / 2022)

Time: 3 Hours

Max. Marks: 50

## Instructions to Candidates:

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

| Q.No         |   | Marks | CO |
|--------------|---|-------|----|
| 1A.          | <ul><li>Explain the functions of the following two overflow devices adopted in sewerage system with neat sketch.</li><li>i. Side flow weir</li><li>ii. Leaping weir</li></ul>   | 3     | 1  |
| 1 <b>B</b> . | Discuss the tests for watertight joints and for correct straight alignment for newly laid sewers  | 4     | 1  |
| 1C.          | What will be the diameter of a circular sewer to carry a discharge of 0.624 cumecs, when flowing full at a slope of 10 in 10,000? Manning's roughness coefficient is 0.012.<br>What would be the discharge and the velocity if the proportionate depth (d/D), discharge (q/Q) and velocity (v/V) are 0.4, 0.32 and 0.88 respectively? | 3     | 1  |
| 2A.          | What is BOD of sewage? What are the factors that affect the deoxygenation constant?<br>If the two days BOD of a sample of sewage is 200 mg/litre at 25°C, what will be its 5 days 30°C BOD? Assume $K_D=0.1/day$ , at 20°c.   | 4     | 2  |
| 2B.          | What are solids in water and wastewater? Explain in detail the classification of solids in wastewater.  | 4     | 2  |
| 2C.          | Differentiate between aerobic and anaerobic process in waste water treatment with examples  | 2     | 3  |
| 3A.          | Give a typical layout of sewage treatment plant for very small town and brief<br>about the purpose of each unit.  | 3     | 3  |
| 3B.          | What is the necessity of grit chamber, comminutors, detritus tank and skimming tanks in sewage treatment plant?   | 4     | 4  |
| 3C.          | A bar screen of 10mm x 50mm is to be provided in an approach channel with width of channel as 0.8m. Design flow of wastewater is 19MLD. Spacing between the bars is 30mm, calculate number of bars and check for head loss, if depth of flow is restricted to 0.7m.   | 3     | 5  |
| 4A.          | Differentiate between the stepped aeration and tapered aeration in activated sludge modifications. Also, explain how F /M ratio is an important feature for the   | 4     | 4  |

|     | operation of activated sludge process   |   |  |   |   |   |
|-----|---|---|--|---|---|---|
| 4B. | Mention the advantages of recirculation in Trickling filter.  |   |  |   |   | 4 |
| 4C. | The average operating data<br>follows:<br>(i). Wastewater flow = 3<br>(ii). Volume of aeration<br>(iii). Influent BOD = 250<br>(iv). Effluent BOD = 20<br>(v). Mixed liquor suspe<br>(vi). Effluent suspended<br>(vii). Quantity of waste<br>Based on the information at<br>a) Aeration period<br>b) Food to Microorgan<br>c) Percentage efficience<br>d) Mean cell residence | 4   | 5  |   |   |   |
| 5A. | Differentiate between primary sludge and secondary sludge.  |   |  |   |   | 4 |
| 5B. | With the neat sketch of oxygen sag curve explain deoxygenation and re oxygenation of stream.  |   |  |   |   | 5 |
| 5C. | A wastewater treatment p<br>Characteristics of stream a<br>8.76mg/l. Calculate the DC<br>determine the critical time a<br>Parameters<br>Flow(m3/s)<br>Dissolved oxygen, mg/l<br>Temperature, ° C<br>BODs at 20°C, mg/l<br>Oxygen consumption<br>rate(K1:at 20° C) (1/day)<br>Oxygen reaeration rate<br>(K2 at 20° C) ( 1/day)   | plant disposes<br>nd effluent is<br>0 at 10km, and<br>and distance.<br>wastewater<br>0.35<br>2<br>20<br>150<br>0.23 | of its effluer<br>given below. A<br>75 km from th<br>4.5<br>8<br>20<br>3<br>-<br>0.3 | nt in a surface stream.<br>Assume saturation DO as<br>e point of disposal. Also | 5 | 5 |