

## JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATION- Oct 2017

M.Tech 1<sup>st</sup> Semester

COURSE CODE: 14M31CE116

MAX. MARKS: 25

COURSE NAME: Wastewater Treatment

COURSE CREDITS: 3

MAX. TIME: 1Hr 30 Min

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*Note: All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means.*

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1. A municipal wastewater having a BOD<sub>5</sub> of 250 mg/l is to be treated by a two stage trickling filter. The desired effluent quality is 25 mg/l of BOD<sub>5</sub>. If both of the filter depths are to be 1.8 m and the recirculation ratio 2.1 for both stages, find the required diameters. Assume the following design assumptions: wastewater flow is 7570 m<sup>3</sup>/day; wastewater temperature is 20° C; BOD<sub>5</sub> removal in primary sedimentation is 35 %; efficiency in both stages is same ( $E_1=E_2$ ). Also show details of distributor for first stage filter. (*Assume any other necessary data suitably*). (8)
2. Draw typical process flow diagram for single stage and two stage trickling filter. (4)
3. Design a complete-mix activated sludge system. Given: average design flow: 100MLD; raw wastewater BOD<sub>5</sub>: 480 mg/l; raw wastewater SS: 580 mg/l; effluent BOD<sub>5</sub> 40 mg/l; effluent TSS 20 mg/l; wastewater temperature: 20° C; operational parameters & coefficients:  $\theta_c = 10$  d; MLSS=2000 mg/l; SS conc. in recycled activated sludge=9300 mg/L;  $Y = 0.5$  mg VSS/mg BOD<sub>5</sub>;  $k_d = 0.06$  /d; BOD<sub>5</sub>/BOD<sub>u</sub> = 0.67. Assume: (a) BOD<sub>5</sub> and SS removal in primary clarifiers are 28 % & 70 % respectively; (b) Specific gravity of the primary sludge is 1.05 and the sludge has 4.4 % of solids content; (c) Oxygen consumption is 1.42 mg per mg of cell oxidized. (*Assume any other necessary data suitably*). (7)
4. Explain following: (a) Difference between Unit Operation and Unit Processes; (b) Objectives of biological treatment; (c) Draw a schematic diagram of a sewage treatment plant using RBC as secondary treatment system for a town. (6)