

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION-2021

B.Tech 5<sup>th</sup> Semester

COURSE CODE:18B11CE512

MAX. MARKS: 35

COURSE NAME: Sewage Treatment and Disposal

COURSE CREDITS: 03

MAX. TIME: 2 Hours

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

**Section-1 (15 marks) (Questions 1-5)**

**Notes : Write to the point answers in bullet points.**

Q.1 Describe the various Stages involved in the "Sludge Digestion Process"? (3 Marks)

Q.2 Explain the various factors that affecting the Sludge Digestion Process? (3 Marks)

Q.3 What is the difference between "Aerobic Attached Culture and Aerobic Suspended Culture"? What are the primary factors which must be considered when a choice is to be made between "Trickling Filter and Activated Sludge Plant"? (3 Marks)

**Attempt any one from the following two choices :-**

**Q.4 Differentiate between the following:**

a) Oxidation Pond and Oxidation Ditch (1.5 Marks)

b) Acid Former and Methane formers (1.5 Marks)

c) MLSS and BOD of a sewage sample. (1.5 Marks)

d) Mixed Flow and Plug flow regime in Activated sludge process. (1.5 Marks)

**OR**

**Q.5 Define the following terms :**

a) Sloughing and Slime layer in a trickling filter. (1.5 Marks)

b) Sludge volume Index. (1.5 Marks)

c) Sludge Thickening. (1.5 Marks)

d) Hydraulic Loading Rate and Organic Loading Rate. (1.5 Marks)

**Section-2 (20 marks) (Question 6-11)**

**Assume suitable data wherever necessary.**

**Q.6** Design a convectional activated sludge plant for the following data:

**(4 Marks)**

1. Population Served = 50,000
2. Average Sewage Flow = 180 L.C.P.D
3. BOD of raw sewage = 200 mg/ltr.
4. BOD removed in Primary Treatment = 35%
5. Overall BOD reduction desired = 80%

For calculating sludge retention time assume  $K=0.06$  and yield coefficient  $=1.0$ ;  $MLSS=2000\text{mg/ltr}$ ;  $F/M=0.35$ ;  $HRT=5\text{hrs}$ ;  $\text{Sludge Age}=6\text{ days}$ ;  $Q_r/Q=0.29$ ;  $\text{Volumetric BOD Loading}=0.32\text{ kg/m}^3$

**Q.7** Raw wastewater is entering a treatment plant and contains 250 mg/l of suspended solids. If 65% of these solids are removed in sedimentation tank:

**(4 Marks)**

1. Find the volume of raw sludge produced per million litre of wastewater. Assume the sludge has moisture content of 96% and specific gravity of solids is 1.2
2. If 55% of raw sludge is changed to liquid and gas in digestion tank, find the volume of digested sludge per million litre of wastewater. Assume the moisture content of digested sludge is 92%.

**Q.8** Design an oxidation pond for treatment of colony with a population of 8,000 people contributing sewage @ 120 LCPD. The 5-day BOD of sewage is 250 mg/ltr.

**(2.5 Marks)**

**Q.9** In a continuous flow settling tank 3 mtr. Deep and 60 mtr. Long. What flow velocity of water would you recommend for effective removal of .025 mm particles at 25 degrees. The specific gravity of particles is 2.65 and kinematic viscosity of water is .01  $\text{cm}^2/\text{sec}$ .

**(2.5 Marks)**

**Q.10** A sewage containing 200 mg/l of suspended solids is passed through primary sedimentation tank, trickling filter and secondary sedimentation tank. How much gas will be produced in digestion of sludge from one million litres of sewage. Assume the suspended solids removed = 90%; volatile solids in sewage = 65%..

**(4 marks)**

**Q.11** The BOD of wastewater sewage has been measured as 600 mg/l. If  $k=0.23/\text{day}$  (base e). What will be the ultimate BOD of the wastewater? What proportion of BOD would be remaining unoxidized after 20 days?

**(3 Marks)**