

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Regular), November 2016

B. Tech in Civil Engineering, Semester V

Roll No.....

CE509 : ENVIRONMENTAL ENGINEERING-II

Time: 3 hours

Max. Marks: 100

Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Assume suitable data wherever required and mention it clearly.
3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.

Q.1A Objective type multiple choice questions (10 questions @ 1 mark)

10

- i. The recirculation ratio of LRTF is :
 - (a) 0.5 to 3.0
 - (b) Zero
 - (c) 1.8 to 3.0
 - (d) 0.32 to 1.0
- ii. The water having human waste usually from lavatories is known as:
 - (a) Black water
 - (b) Grey water
 - (c) Storm water
 - (d) Toxic water
- iii. "Sameer", it is a applications for Android devices is developed by CPCB for:
 - (a) River Ganga water quality monitoring
 - (b) Display of National Air Quality Index Values
 - (c) Biological assessment of Surface water bodies
 - (d) Lakes water quality monitoring
- iv. The sludge volume Index in Activated Sludge Process (ASP) varies from :
 - (a) 50 to 150 mL/g of Suspended Solids (SS)
 - (b) 150 to 250 mL/g of Suspended Solids (SS)
 - (c) 250 to 350 mL/g of Suspended Solids (SS)
 - (d) 10 to 50 mL/g of Suspended Solids (SS)
- v. Identify the correct statement w.r.t. Stream Protection Measures the Effluent Standards method for maintaining a stream :
 - (a) Allows public to establish goals for present and future water quality
 - (b) They do not establish an overall level of pollutant loading for a given water body
 - (c) Prevention of excessive pollution/ Loading is limited to what the stream can assimilate
 - (d) All are incorrect
- vi. In a WWT plant , the submerged area of the surface of the screen, including bars and opening should be about :
 - (a) 300% of the cross sectional area of the incoming sewer for separate system
 - (b) 200% of the cross sectional area of the incoming sewer for combine system

- (c) 200% of the cross sectional area of the incoming sewer for separate system
- (d) 100% of the cross sectional area of the incoming sewer for combine system
- vii. The National Green Tribunal (NGT) has been established in:
 - (a) 2009
 - (b) 2000
 - (c) 2010
 - (d) 2013
- viii. Up flow Anaerobic Sludge Blanket (UASB) reactor of waste water treatment system have :
 - (a) Air diffusers
 - (b) Mechanical aerators
 - (c) No aerators
 - (d) None of these
- ix. Suspended- culture system of waste water treatment consist of :
 - (a) Ponds and Lagoons
 - (b) Rotating Biological Contactors
 - (c) Both a & b are correct
 - (d) Both a & b are incorrect
- x. While observing flow pattern of reactors if the Dispersion number $(D/UL) \geq 3.0$ to 4.0 :
 - (a) indicates hydraulic regime approaching completely mixed conditions
 - (b) indicates hydraulic regime approaching Plug Flow conditions
 - (c) indicates Ideal Plug Flow conditions
 - (d) None of these

- Q.2 Short answer type questions (4 questions @ 2.5 marks) 10
 Explain the difference between w.r.t. protection of Stream Quality:
 i. Effluent Standard System and ii. Stream Standard System.
 Write short note on the following:
 i. Chain- of-Custody Procedures to ensure sample integrity
 ii. NRC Equation
- Q.3A Locate the point of generation of liquid waste for a woven fabric finishing process in a textile mill industry with the help of typical industrial process block diagram. 05
- Q.3B Write short note on the following types of Reactors used: 05
 i. Plug-Flow (Tabular Flow) Reactor ii. Fluidized Bed Reactor
- Q.4A The dissolved oxygen in an unseeded sample of diluted waste water having an initial DO of 9.0 mg/L is measured to be 3.0 mg/L after 5 days. The dilution fraction is 0.03 and reaction rate constant $k = 0.22 \text{ day}^{-1}$. Calculate: 05
 (a) 5 day BOD of the waste
 (b) Ultimate carbonaceous BOD
 (c) What would be remaining oxygen demand after 5 days?
- Q.4B The treated waste water is being discharged in to a river of 15 °C. The BOD rate constant determined in the laboratory for this mixed water is 0.12 per day. What fraction of maximum oxygen consumption will occur in first four days? 05

- Q.5A Explain with schematic diagram the UASB Reactor in waste water treatment process. 05
- Q.5B Explain the difference between the following : 05
i. Ponds ii. Lagoons
- Q.6A Write brief note on the following: 05
(a) Nitrogenous BOD
(b) Theoretical Oxygen Demand (ThOD)
- Q.6B Write down the design criteria for the following filters: 05
i. LRTF ii. HRTF
OR
- Q.6B Define the "Flocculant Settling" and explain how does the efficiency of sedimentation tank affected by different conditions w.r.t. suspended solid and BOD removal. 05
- Q.7A Draw a curve for BOD exerted and remaining with respect to time for organic waste water and derive the mathematical expression for both. 05
- Q.7B Classify the sludge generated during waste water treatment and explain each in detail. 05
OR
- Q.7B Draw a table for estimation of water use in household based on primary survey conducted by you in housing society of Jaipur. 05
- Q.8A Explain in detail the basic engineering approach for developing an industrial waste water treatment system. 10
- Q.9A Design a Low Rate Trickling Filter (LRTF) to treat 6.0 MLD of sewage of BOD of 210 mg/L. The final effluent should be 30 mg/L and organic loading rate is 320 g/m³/d. 10
- Q.9B Design a grit chamber for population 50000 with water consumption of 135 LPCD. Assume the following data as: 10
Sewage generation = 80% of water supply
Horizontal velocity = 0.2 m/s
Detention time period = 1 minute
OR
- Q.9B Design a Bar Screen Chamber for average sewage flow of 20 MLD, minimum sewage flow of 12 MLD and maximum flow of 30 MLD. Take following assumptions: 10
- Assume manual Cleaning
- Angle of inclination of bar with horizontal is 30°
- Assume bar size: 9mm × 50 mm × 9 mm facing the flow
- Bar Spacing provided is 30 mm
- Number of bars provided is equal to 30