

[Total No. of Questions - 9] [Total No. of Printed Pages - 4]
(2125)

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M. Tech 1st Semester Examination
Advanced Waste Water Treatment

WRE-111

Time : 3 Hours

Max. Marks : 100

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt five questions in all, select one question from each sections A, B, C and D. Section E is compulsory.

SECTION - A

1. (a) Differentiate between:
 - (i) Domestic sewage, Industrial sewage and sanitary sewage.
 - (ii) Combined and separate system of sewage.
 - (iii) Sewage and drainage. (10)
 - (b) (i) The 5 day 30°C BOD of sewage is 110mg/l. Calculate its 5 days 20°C BOD. Assume the de-oxygenation constant at 20°C, Assume K_{20} as 0.1.
 - (ii) Calculate 1 day 37°C BOD of sewage sample, whose 5 day 20°C BOD is 100mg/l. Assume K_D at 20°C as 0.1 (5x2=10)
2. (a) Name two most important parameters used to characterise sewage and describe their significance in detail. (10)

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- (b) The 7 days BOD of a sample of sewage is 300ppm and its 3 days 37°C BOD is 500ppm. Find out the value of deoxygenation constant k , and then estimate its 5 days 30° C BOD. (10)

SECTION - B

3. (a) Give the flow diagram of activated sludge process, and describe the working of the activated sludge plant in detail. (10)
 - (b) Design a circular settling tank unit for a primary treatment of sewage at 12 million liters per day. Assume suitable values of detention period (presuming that trickling filters are to follow the sedimentation tank) and surface loading. (10)
4. Design a conventional activated sludge plant to treat domestic sewage with diffused air aeration system, given the following data:
Population = 35000
Average sewage flow = 180 lpcd
BOD of sewage = 220 mg/l
BOD removal in primary treatment = 30%
Overall BOD reduction desired = 85% (20)

SECTION - C

5. (a) Discuss anaerobic digestion of sludge under the following heads:
 - (i) Definition and composition of sludge.
 - (ii) Fundamental mechanism of anaerobic digestion.
 - (iii) End products and their disposal. (10)

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(b) Design an oxidation pond for treating sewage from a hot climatic residential colony with 5000 persons, contributing sewage @120 litres per capita per day. The 5-day BOD of sewage is 300mg/l. (assume suitable data if required). (10)

6. A city discharges 100 cumecs of sewage into a river, which is fully saturated with oxygen and flowing at the rate of 1500 cumecs during its lean days with a velocity of 0.1m/s. The 5 days BOD of sewage at the given temperature is 280 mg/l. Find when and where the critical D.O. deficit will occur in the downstream portion of the river and what is its amount? Assume coefficient of purification of the stream (f) as 4.0 and coefficient of de-oxygenation (K_D) as 0.1. (20)

SECTION - D

7. (a) What are the various methods to remove dissolved solids? Describe the principle of tertiary treatment and adsorption and the factors effecting adsorption. (10)

(b) Explain the following processes in detail: (1) Reverse osmosis (2) Ultra filtration (3) Electro dialysis (4) Desalination. (10)

8. With respect to the quantum, concentration, toxicity and presence of non-biodegradable organics in waste water, explain the following treatment processes.

(i) Equalization.

(ii) Neutralization.

(iii) Physical treatment.

(iv) Chemical treatment.

(v) Biological treatment. (20)

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SECTION - E

9. Write short notes (in about 50 words) on the following:

(i) Cycles of decay of waste organic substances.

(ii) COD and BOD.

(iii) Concentration of solids in sewage.

(iv) Population Equivalent.

(v) Composition of Municipal sewage.

(vi) BOD/COD ratio.

(vii) TOC.

(viii) Sludge digestion. (8×2½=20)