KUMARAGURU
college of technology
character is life

Register Number:……..…

M.E DEGREE EXAMINATIONS: DEC 2022

(Regulation 2018)

First Semester

ENVIRONMENTAL ENGINEERING

P18EET1002: Physio-Chemical for Water and Wastewater Treatment

COURSE OUTCOMES

CO1: Implement the working principles and mechanisms of various Unit operation/Processes reactors

CO2: Design the various water/wastewater Unit operation/treatment processes

CO3: Apply the suitable advanced wastewater treatment processes in conjunction with the unit operation/processes.

CO4: Design and select an appropriate biological treatment process based on the kinetics study and organic loading

CO5: Design of low cost and natural water treatment systems

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. **Assertion:** The BOD gets removed at very fast rate immediately after sewage is discharged into a river CO1 [K2]
Reason: The part of BOD in the sewage is due to settleable organic matter

a) Both A and R are Individually true, and R is the correct explanation of A
b) Both A and R are individually true, and R is the not correct explanation of A
c) A is true but R is false
d) A is false but R is true

2. In the oxidation ditch, the excess sludge is taken to CO2 [K_2]

a) Anaerobic digester
b) Aerobic digester
c) Drying beds
d) Incinerator.

3. The gas coming out from a sludge digestion tank is CO3 [K_1]

a) Methane
b) Carbon dioxide
c) 70% methane and 30% carbon dioxide
d) 30% methane and 70% carbon dioxide

4. Matching type item with multiple-choice code CO2 [K_2]

List I	List II
A. Comminution	i. Blending chemicals with wastewater
B. Mixing	ii. Temporary storage to equalize flowrates
C. Flow Equalization	iii. Grinding of coarse solids to reduce the size
D. Flotation	iv. Removal of finely divided suspended solids

	A	B	C	D
a)	i	iii	ii	iv
b)	iii	i	iv	ii
c)	iii	i	ii	iv
d)	i	iii	iv	ii

5. Assertion (A): The BOD test is conducted for 5days at a 20-degree Celsius CO4 [K_2]
Reason (R): The ultimate BOD is independent of time and temperature

a) Both A and R are Individually true, and R is the correct explanation of A
b) Both A and R are individually true, and R is the not correct explanation of A
c) A is true but R is false
d) A is false but R is true

6. Stripping is widely used to remove CO4 [K_1]

a) Volatile components
b) Inorganic matter
c) Organic matter
d) Chemicals

7. Arrange the following treatment processes as per the order of merit CO5 [K_1]

1. Coagulation 2. Flocculation
3. Sedimentation 4. Disinfection

a) 1-2-3-4
b) 2-3-4-1
c) 3-4-2-1
d) 4-3-2-1

8. Assertion (A): Decomposition of vegetable matter into compost is an example of exothermic reactions. CO5 [K_2]

Reason (R): Exothermic reactions are those reactions in which heat is evolved.

a) Both A and R are individually true and R is the correct explanation of A
b) Both A and R are individually true and R is the not correct explanation of A
c) A is true but R is false
d) A is false but R is true

9. Surface loading of a sedimentation tank varies in the range CO3 [K_1]

a) 100 – 500 l/hr/m2
b) 500 – 750l/hr/m2
c) 1000- 1250 l/hr/m2
d) 750 – 1000l/hr/m2

10. The treatment, which is generally given to treat raw water supplies, follows the sequences — CO1 [K_1]

a) Screening, Sedimentation, Disinfection, Filtration
b) Screening, Sedimentation, Filtration, Disinfection
c) Screening, Sedimentation, Disinfection, Aeration
d) Screening, Sedimentation, Disinfection, Filtration

PART B (10 x 2 = 20 Marks)

11. List the various types of coagulants used in water treatment. CO1 [K_2]
12. Distinguish between hydraulic profile and PID CO1 [K_2]
13. Write the working principles of RO Plant with sketch. CO2 [K3]
14. State the mechanisms of the disinfection process CO2 [K_1]
15. Design the slow sand filter beds for the following data. CO3 [K_3]
    Population = 1,50,000
    Per capita demand -150lit/day
    Rate of filtration -180 lit/hr/m2
16. State the advantages of sludge thickening. CO4 [K_1]
17. List the various types of the incineration process. CO5 [K_2]
18. How the residues from skimming tanks can be disposed of? CO4 [K_1]
19. Find the settling velocity of a discrete particle in water. The diameter and specific gravity of the particle is 5x 10 -3 and 2.65 respectively. Kinematic viscosity of water c = 1.01x 10 -2 cm2/sec. CO5 [K_3]
20. State the theory of the sedimentation CO3 [K_3]

PART C (10 x 5 = 50 Marks)

21. Design an aerated grit chamber for treating municipal waste water with average flow rate of 0.5m3/sec. Assume the peak flow rate to be 3 times the average. CO4 [K3]
22. Explain the need of Equalization and Neutralization in Industrial wastewater treatment. CO1 [K_2]
23. Discuss various steps involved in the preparation, regeneration, and reactivation of activated carbon CO2 [K_2]
24. Outline the features of aeration in water treatment and explain the different types of aerators employed in the water treatment units. CO4 [K_2]
25. List out physical and chemical characteristics of industrial wastewater CO4 [K_2]
26. Explain any two recent advancements (trends) in physio-chemical treatment system CO5 [K_2]

27.	Design a septic tank for the following data: No. of people = 150 Sewage/capita/day = 120 liters per person De-sludging period = 1 year	CO5	[K_3]
28.	List and explain the various types of advanced oxidation process.	CO3	[K_3]
29.	How will you dispose the sludge from a wastewater treatment plant?	CO3	[K_1]
30.	Write the procedure for finding the BOD of a wastewater in the lab	CO2	[K_3]

Answer any TWO Questions
PART D (2 x 10 = 20 Marks)

31.	Design a rapid sand filter unit for 3.8 million liters per day of supply with all its principal components. Assume whatever data are necessary.	CO3	[K_3]
32.	Calculate the area of land required for drying the sludge from the digestion tank for 40,000 population. The sludge content per capita per day is 0.068 kg. The moisture of the sludge is 94% and the specific gravity of the wet sludge is 1.02. Also design the dimensions of beds.	CO4	[K_3]
33.	Explain the working principles of ion exchange method to treat the water/wastewater	CO2	[K2]

****