

B.E. PRINTING ENGINEERING SECOND YEAR SECOND SEMESTER -2017

ENVIRONMENTAL SCIENCE

TIME: 3 h

FULL MARKS: 100

ANSWER ANY FIVE QUESTIONS

(Use graph paper if required)

1. Answer any three

Write short note of the following:

- a. Cyclone Separator
- b. Electrostatic Precipitators
- c. Jet Scrubber
- d. Pollutants from combustion (burning) w.r.t Indoor Air Pollution.
- e. Pit Privy
- f. Bore Hole Latrine

[5×4=20 marks]

2.

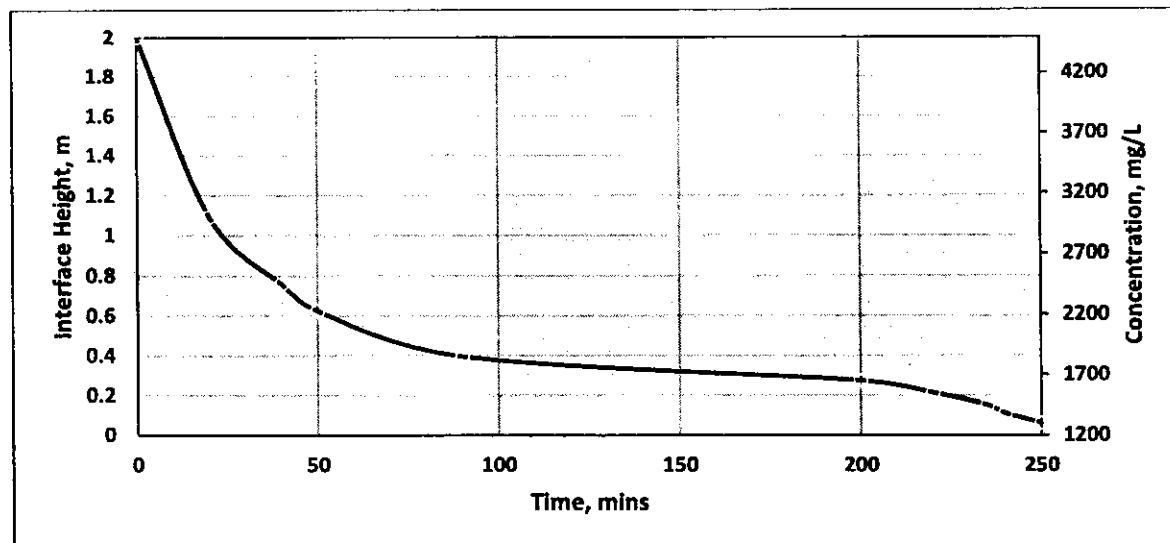
a. Design a horizontal flow grit chamber with rectangular cross section for treating maximum sewage flow of 15.9 MLD at a maximum temperature of 40°C during summer and minimum temperature of 15°C in winter. [10 marks]

b. Design a bar screen chamber for average sewage flow 30.325 MLD, minimum sewage flow of 15.985 MLD and maximum flow of 40.736 MLD. [10 marks]

3.

a. Design the primary sedimentary tank to treat wastewater with average flow rate of 8 MLD and peak flow of 27.145 MLD. [10 marks]

b. Calculate the size of SST for ASP. In a settling cylinder of 2 m height the settling test was performed, and the settling curve is shown below for an activated sludge with initial solid concentration, $C_0 = 4500$ mg/L. Determine the area yield a thickened sludge concentration C_u of 18.42 g/L with an inflow of 500 m³/day. In addition, determine the solids loading in kg/m².day and the overflow rate in m³/m².day. [10 marks]



4.

I. Multiple choice questions:

[7 mar

- a. Which instrument is used the measurement of SO_2
- | | | | | | | | |
|----|-------------------------|-----|------|------|-----|-----|-----------------|
| i. | Improved west and Geake | ii. | TOEM | iii. | AAS | iv. | Chemical Method |
|----|-------------------------|-----|------|------|-----|-----|-----------------|
- b. What is the height requirement for sample location guidelines of SPM?
- | | | | | | | | |
|----|--------|-----|---------|------|---------|-----|---------|
| i. | - 10 m | ii. | 1 - 4 m | iii. | 5 - 7 m | iv. | 4 - 9 m |
|----|--------|-----|---------|------|---------|-----|---------|
- c. What is the full form of EDTA?
- | | | | | | | | |
|----|----------------------------------|-----|---------------------------------|------|--------------------------------|-----|---------------------------|
| i. | Ethylene diaminetetraacetic acid | ii. | Methane diaminetetraacetic acid | iii. | Butene diaminetetraacetic acid | iv. | N-diaminetetraacetic acid |
|----|----------------------------------|-----|---------------------------------|------|--------------------------------|-----|---------------------------|
- d. Example of combustion process
- | | | | | | | | |
|----|--------------|-----|-----------------------|------|----------------------|-----|---------------------|
| i. | incineration | ii. | Crushing and grinding | iii. | Mixing and packaging | iv. | Cutting and forming |
|----|--------------|-----|-----------------------|------|----------------------|-----|---------------------|
- e. Which rule lays down procedures for setting standards of emission or discharge of environmental pollutants
- | | | | | | | | |
|----|---|-----|--|------|---|-----|---|
| i. | 1986 - The Environment (Protection) Rules | ii. | 1989 - Hazardous waste (Management and Handling) Rules | iii. | 1986 - The Environment (Protection) Act | iv. | 1991 - The Public Liability Insurance Act and Rules and Amendment |
|----|---|-----|--|------|---|-----|---|
- f. Which rule defines the procedures of the meetings of the Boards and the powers entrusted on them.

Concentration, mg/L

- i. 1987 – Air (Prevention and Control of Pollution) Amendment Act
- ii. 1982 – Air (Prevention and Control of Pollution) Rules
- iii. 1981 – Air (Prevention and Control of Pollution) Act
- iv. 1982 – Atomic Energy Act

- g. On which date the Air Amendment Act of 1987 came into force.
- i. S.O.416(E), [20/6/1991]
 - ii. G.S.R.347(E), [1/8/1996]
 - iii. G.S.R.382(E), [28/3/1988]
 - iv. S.O.1088(E), [11/10/2002]

II. A blast furnace gas has the following volumetric analysis. $H_2 = 9\%$, $CO = 24\%$, $CH_4 = 2\%$, $CO_2 = 6\%$, $O_2 = 3\%$ and $N_2 = 56\%$. Determine the ultimate gravimetric analysis. [6 marks]

III. Design a grit chamber for population 60000 with water consumption of 140.235 LPCD. [7 marks]

5.

a. A city discharges 30000 m³/day of sewage into a river whose rate of flow is 0.8 m³/sec. Determine D.O, deficit profile for 100 km from the following data:

River	Sewage effluent from STP
5-day B.O.D at 20°C = 3.5 mg/l	5-day B.O.D at 20°C = 45.67 mg/l
Temperature 23°C	Temperature 26°C
D.O. = 8.0 mg/l	D.O. = 2.4 mg/l

Velocity of mix = 0.2674 m/sec, $R' = 0.415$, $K' = 0.237$ [10 marks]

b. Design a bar screen chamber for average sewage flow 30.325 MLD, minimum sewage flow of 15.985 MLD and maximum flow of 40.736 MLD. [10 marks]

6.

a. Design a sludge drying bed for drying the digested sludge volume of 229 m³/day. Consider the dewatering, drying and sludge removal cycle of 10 days. [10 marks]

b. Describe advantages of sludge thickening and explain gravity thickening [4 marks]

c. Describe sludge thickening by air floatation unit. [6 marks]

7.

a. Describe various options available for final disposal of the dewatered sludge. [8 marks]

b. Determine the size of the septic tank and percolation field for hostel which has 200 residents. The average percolation rate has been determined to be 5 mm/min. Consider rate of wastewater generation 120 L/capita.day. [5 marks]

c. Describe septic tank. State advantages and disadvantages of the septic tank. [7marks]

8.

a. What are the sources of noise pollution. [4 marks]

b. What are the effects of noise pollution. [6 marks]

c. Arrange the following [4 marks]

Category of Area	Day time (6 am – 9 pm)	Night time (9 am – 6 am)
Industrial Area	70	55
Commercial Area	55	40
Residential Area	50	75
Silence Zone (100 m around premises of hospitals, educational institutions etc)	45	65

d. Fill in the blank [6 marks]

Source	Intensity (W/m^2)	Intensity level (dB)	# of times greater than TOH
Threshold of hearing			
Rustling leaves			
Whisper			
Normal conversation			
Large orchestra			
Vacuum cleaner			
Walkman at maximum level			
Military jet takeoff			
Threshold of pain			
Busy street conversation			
Instant perforation of eardrum			
Front row of row concert			
