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CE 181604

Roll No. of candidate

6/19/22

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2022

B.Tech. 6th Semester End-Term Examination

ENVIRONMENTAL ENGINEERING-II

(New Regulation and New Syllabus)

Full Marks – 70

Time – Three hours

The figures in the margin indicate full marks
for the questions.

Answer question No. 1 and any *four* from the rest.

1. Answer the following (MCQ/ Fill in the blanks) : (10 × 1 = 10)
- (i) Sewage sickness is the term used for
- (a) Persons who become sick after drinking polluted water
 - (b) A treatment plant which does not function properly
 - (c) A stream where the flora and fauna die due to sewage flow
 - (d) Condition of land where sewage is applied continuously for a long period
- (ii) Waste water treatment units are generally designed for
- (a) Maximum flow only
 - (b) Minimum flow only
 - (c) Average flow only
 - (d) Maximum and minimum flow both
- (iii) The maximum efficiency of BOD removal is achieved in
- (a) Oxidation ditch
 - (b) Oxidation pond
 - (c) Aerated lagoon
 - (d) Trickling filter

[Turn over

- (iv) The gas production from a sludge digestion tank is .
- (a) Methane only
 - (b) Carbon dioxide only
 - (c) 70% methane and 30% carbon dioxide
 - (d) 30% methane and 70% carbon dioxide
- (v) The solid waste management hierarchy is
- A. Reuse B. reduce C. Recovery D. Recycle E. Disposal
- (a) ABCDE
 - (b) BACDE
 - (c) BADCE
 - (d) ABDCE
- (vi) The ultimate BOD value of a waste
- (a) Increase with temperature
 - (b) Decrease with temperature
 - (c) Remains the same at all temperature
 - (d) Double with every 10°C rise in temperature
- (vii) The station or building which is constructed for temporary collection of solid waste is called as
- (a) Terminal station
 - (b) Transfer station
 - (c) Collection station.
 - (d) Disposal point
- (viii) Which of the following plume behaviors occurs when atmospheric inversion begins from the ground level and continues?
- (a) Looping
 - (b) Fumigation
 - (c) Coning
 - (d) Fanning
- (ix) A decrease in the radius of cyclone collector will:
- (a) increase efficiency
 - (b) decrease in efficiency
 - (c) not affect its efficiency
 - (d) none of the above

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(x) The weighting network that is usually used to filter out certain frequencies of sound in our day-to-day sound measurement is of:

- (a) A type
- (b) B type
- (c) C type
- (d) None of the above

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2. (a) Identify different unit processes and operation in sewage treatment plant by drawing a flow chart. (6)
- (b) The sewage flows from a primary settling tank to a standard rate trickling filter at a rate of 5 million litres per day BOD of 150 mg/l. Determine the depth and the volume of the filter, adopting a surface loading of 2500 l/m²/day and an organic loading of 165 g/m³/day. Also determine the efficiency of the filter unit, using NRC formula. (9)
3. (a) Explain the types of settling in waste water. How will you determine the removal efficiency of a basin? (5)
- (b) Why coagulants are used in the sewage treatment? (2)
- (c) (i) Design an aerated grit chamber for treating municipal waste water with average flow rate of 45MLD. Assume the peak flow rate to be 3 times the average. (8)

Or

- (ii) A 30 cm dia. Sewer having an invert slope of 1 in 150 was flowing full. What would be the velocity of flow and discharge? ($N=0.013$). Is the velocity self-cleaning? What would be the velocity and the discharge when the same is flowing 0.4 of its full depth? [min velocity for 30 cm dia. Pipe- 75 cm/sec. At 0.4 depth ratio, velocity ratio=0.9, discharge ratio=0.337, aera ratio=0.373, hydraulic mean depth ratio=0.857]. (8)

4. Write short notes on (any three) : (3 × 5 = 15)

- (a) Describe the treatment of sewage by activated sludge process. Mention the advantages and dis-advantages of this system.
- (b) Difference between Attach growth process and suspended growth process, write two examples of each.
- (c) Oxidation pond and oxidation ditch
- (d) Standard rate trickling filter and high-rate trickling filter

5. (a) Differentiate between the environmental lapse rate (ELR) and adiabatic lapse rate (ALR). (5)
- (b) Describe the harmful effects of important air pollutants on materials and services, as well as on aquatic life. (5)
- (c) (i) Write about the working principle of gravitational settling chambers (5)

Or

(ii) An air parcel having 40°C temperature moves from ground level to 500m elevation in dry air following the "adiabatic lapse rate". What will be the resulting temperature of air parcel at 500m elevation? (5)

6. (a) What are the physical properties of solid waste. (3)
- (b) What are the different types of collection system? Which one is more preferable for your city and why? (2+1+3=6)
- (c) The composition of a certain MSW sample and specific weights of its various components are given below. What will be the specific weight (kg/m^3) of the MSW sample? (6)

| Components | Percent by weight | Specific weight (kg/m^3) |
|---------------------|-------------------|------------------------------|
| Food waste | 50 | 300 |
| Dirt and ash | 30 | 500 |
| Plastics | 10 | 65 |
| Wood and yard waste | 10 | 125 |

7. (a) What are the classifications of sound? Write with examples. (3)
- (b) An air conditioner generates a noise level of 75 dB for five minutes every hour. If the background noise level is 55dB, compute the L_{Aeq} . (7)
- (c) Determine the sound pressure level from combining the following four levels:
58,62,65 and 68dB. (5)

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