ENVIRONMENTAL ENGINEERING
(CIVL 3104)

Time Allotted : 3 hrs **Full Marks : 70**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**

(i) When the rainy season is confined to a few months, like that in India the preferred sewerage system would be:
(a) Combined system (b) Partially separate system
(c) Separate system (d) None of these.

(ii) According to the Indian Standard recommendations, water requirement per capita per day in a residential building is
(a) 50 litres (b) 115 litres (c) 135 litres (d) 160 litres.

(iii) Alum as a coagulant is found to be most effective when pH range of water is
(a) 2 to 4 (b) 4 to 6 (c) 6 to 8 (d) 8 to 10.

(iv) Which of the following is not true about plastic pipes?
(a) Plastic pipes are cheaper than the metal pipes
(b) Plastic pipes are light in weight
(c) Plastic pipes can be installed with ordinary tools
(d) Plastic pipes are corrosive.

(v) Which of the method is used in removing hardness of water?
(a) Treatment with Ozone
(b) Chlorination
(c) Treatment with Lime soda process
(d) Treatment with Silver Electro-Katadyn process.

(vi) Which water treatment process is done after filtration of water?
(a) Primary sedimentation (b) Disinfection
(c) Secondary sedimentation (d) Flocculation.

(vii) Crown corrosion in a reinforced concrete sewer is caused by
(a) H_2S (b) CO_2 (c) CH_4 (d) NH_3.

(viii) Which of the following units is used for aeration?
(a) Sedimentation tank (b) Cascade towers
(c) Ultraviolet chamber (d) Zeolite exchanger.

(ix) The pathogens can be killed by:
(a) Nitrification (b) Chlorination
(c) Oxidation (d) All of the above.

(x) Temporary hardness in water is caused by
(a) Chlorides of Ca^{++} and Mg^{++} (b) Sulphates of Ca^{++} and Mg^{++}
(c) Bicarbonates of Ca^{++} and Mg^{++} (d) Nitrates of Ca^{++} and Mg^{++}.

Group – B

2. (a) Calculate the storage required to supply the demand shown in the following table if the inflow of water to the reservoir is maintained at a uniform rate throughout 24 hours.

Time (hr)	00-04	04-08	08-12	12-16	16-20	20-24
Demand in million liters	0.48	0.87	1.33	1.00	0.82	0.54

(b) What are the requirements of a good distribution system?

8 + 4 = 12

3. Explain the following water demands: -
(i) Domestic water demand
(ii) Fire demand
(iii) Industrial water demand.

(3 × 4) = 12

Group – C

4. (a) A rectangular sedimentation basin is to handle 10 million litres/day of raw water. A detention basin of width to length ratio of 1/3 is proposed to trap all particles larger than 0·04 mm in size. Assume a relative density of 2·65 for the particles and 20°C as the average temperature. Compute the basin dimensions. If the depth of tank is 3·5 m, calculate the detention time.

(b) State the factors affecting the settlement of a particle in type 1 settlement.

8 + 4 = 12

5. (a) Draw a typical flow diagram for treating hard ground water. Briefly explain each unit.

(b) Explain the process of chlorination.

8 + 4 = 12

Group – D

6. (a) What do you mean by variation in flow of sewage? Explain average flow, dry weather flow, and maximum flow.

(b) Write a short note on following terms:
(i) Self cleansing velocity
(ii) Non-scouring velocity.

5 + 7 = 12

7. (a) A combined sewer of a circular section is to be laid to serve a particular area. Calculate the size of the sewer from the following data:
Area to be served = 120 hectares
Population = 1,00,000
Maximum permissible flow velocity = 3m/sec
Time of entry for storm water = 10min
Time of flow in channel = 20min
Per capita water supply = 250lit/day/person
Coefficient of run-off for the area = 0.45
Hourly maximum rainfall for the area at the design frequency = 5cm
Assume any other data, if needed.

(b) Determine the size of a circular sewer for a discharge of 600litres/sec running half full. Assume i = 0001 and n = 0.015.

8 + 4 = 12

Group – E

8. (a) Write short notes on Biochemical Oxygen Demand (BOD) and Chemical oxygen demand (COD), and establish a relation between them.

(b) Explain in brief the working principle of Activated sludge process.

7 + 5 = 12

9. (a) Determine the BOD_5 of the effluent from a single-stage, low-rate trickling filter that has a filter volume of 1443 m^3, a hydraulic flow rate of 1900 m^3/d, and a recirculation factor of 2.78. The influent BOD_5 is 150mg/L.

(b) Write a short note on screening process.

7 + 5 = 12

Department & Section	Submission link:
CE	https://classroom.google.com/c/MjMxNDk3NzI5MzQ4/a/Mjc0NjYyNjUwMDg2/details