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Code No.

i.   *Answers should be given by filling the Multiple-Choice Questions' Answer Sheet.*
ii.   *The main answer sheet can be used for rough work.*

| GROUP A *(Multiple-Choice Questions)* | [10x1=10] | Time: 20 Minutes |

1. The wastewater coming from kitchens, bath rooms and wash basin is known as

   (a) sullage   (b) domestic sewage   (c) Sewage   (d) drainage discharge

2. The sewer pipes have to be designed and checked for

   (a) Only maximum flow   (b) Only minimum flow   (c) Only average flow
   (d) both maximum and minimum flow

3. Most of the components of a sewerage project have a design period of

   (a) 60 years   (b) 45 years   (c) 30 years   (d) 15 years

4. If the time of concentration is 12 minutes, then the intensity of rainfall according the US Ministry of Health Formula will be about

   (a) 5 mm/hr   (b) 15 mm/hr   (c) 25 mm/hr   (d) 35 mm/hr

5. The minimum dissolved oxygen (DO) which should always be present in water in order to save the Aquatic life in a river or stream is

   (a) 2 ppm   (b) 4 ppm   (c) 6 ppm   (d) 9.2 ppm

6. For a grit chamber, if the recommended velocity is 0.2 m/s and detention time is 1 minute, the length of The grit chamber is

   (a) 8 m   (b) 10 m   (c) 12 m   (d) 15 m

7. The rate of sludge accumulation in a septic tank is generally of the order of

   (a) 10 liters/person/year   (b) 20 liters/person/year
   (c) 30 liters/person/year   (d) 50 liters/person/year

8. The minimum horizontal distance for locating a pit privy from a well or hand pump is

   (a) 10 m   (b) 30 m   (c) 50 m   (d) 100 m

9. In a conventional activated sludge plant, the oxygen demand is highest near the

   (a) Inlet of the aeration tank   (b) outlet of the aeration tank
   (c) Inlet end of the clarifier   (d) outlet end of the clarifier

10. Normal value of surface loading for secondary settling tank for sewage at average flow ranges from
(a) 5 to 10 m^3/day/m^2 (b) 10 to 15 m^3/day/m^2 (c) 15 to 20 m^3/day/m^2
(d) 25 to 30 m^3/day/m^2
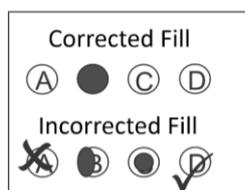
Multiple Choice Questions' Answer Sheet

Marks Secured: _____

In Words: _____

Examiner's Sign: _____ Date: _____

Scrutinizer's Marks: _____

In Words: _____

Scrutinizer's Sign: _____ Date: _____

Corrected Fill
Ⓐ ● Ⓒ Ⓓ

Incorrected Fill
✗ Ⓑ ● Ⓓ

1. Ⓐ Ⓑ Ⓒ Ⓓ	6. Ⓐ Ⓑ Ⓒ Ⓓ
2. Ⓐ Ⓑ Ⓒ Ⓓ	7. Ⓐ Ⓑ Ⓒ Ⓓ
3. Ⓐ Ⓑ Ⓒ Ⓓ	8. Ⓐ Ⓑ Ⓒ Ⓓ
4. Ⓐ Ⓑ Ⓒ Ⓓ	9. Ⓐ Ⓑ Ⓒ Ⓓ
5. Ⓐ Ⓑ Ⓒ Ⓓ	10. Ⓐ Ⓑ Ⓒ Ⓓ

School: SOE	Level: BE	Time: 3 Hours
Program: BCE	Year/Part: IV/I	Full Marks: 50
Subject: Sanitary Engineering (EG702CE)		

✓ *Candidates are required to give their answers in their own words as far as practicable.*
✓ *The figures in the margin indicate **Full Marks**.*
✓ *Assume suitable data if necessary.*

GROUP A *(Multiple-Choice Questions in separate paper)*   **[10×1=10]**

GROUP B *(Short Answer Questions - **Attempt Any Eight**)*   **[8×2=16]**

1. **1.** Discuss the importance of wastewater management in brief.
2. What do you mean by sewer appurtenances? Explain the necessity of sewer appurtenances in brief.
3. A small town with a population of 25,000 residing on an area of 30 ha is provided water supply @ 120 lpcd. If, runoff coefficient of the area is = 0.6; time of entry =12 min and time of flow = 10 min, find the design discharge for a combined sewer.
4. An area of 25 square kilometer has a population density of 300 persons per hectare. The average rate of sanitary sewage flow is 300 lpcd. The maximum flow is 50% in excess of average sewage flow. The rainfall equivalent is 20 mm in 24 hours, all of which is runoff. Assuming V_{max} as 3 m/sec, find the diameter of combined sewer.
5. If 5 day BOD of a sample is 280 mg/l and ultimate BOD at the same temperature is 400 mg/l, find at what rate the waste is oxidized.
6. Describe the methods used in the management of solid waste producing from a locality.
7. Explain the various sources of sludge and necessity of treatment in brief.
8. Discuss "Sloughing" in trickling filter with neat sketch.
9. Describe briefly various types of settling.

Group - C *(Long answer Questions - Attempt any six Questions)*   **[6x4=24]**

1. 120 m^3 /sec of sewage is discharged into a river having a rate of flow 1600 m^3 /sec during lean period
   with a velocity 0.1 m/sec. The 5 day BOD of sewage at the given temperature is 250 mg/lit. Find the amount of critical DO deficit and when and where it will occur in the downstream of the river. Assume deoxygenation constant K as 0.1 per day and coefficient of self -purification f_s as 3.5. Saturation DO at given temperature is 9.2 mg/lit.
2. Determine the effluent BOD in the two stage trickling filter. The available system is functioning for the
   wastewater flow rate of 1.9 x 10^6 liter/day with characteristics of 185 mg/lit BOD_5 in influent. Recirculation factor for trickling filter for both stage = 2.4. The existing filter volume of first stage is 1800 m^3 and the second stage is 1500 m^3.
3. The average operating data for a conventional activated sludge treatment plant is as follows:

(ⅰ) Sewage flow = 50 MLD   (ⅱ) Volume of aeration tank = 16000 m³
(iii) Influent BOD = 250 mg/lit   (iv) Effluent BOD = 30 mg/lit
(v) MLSS = 2500 mg/lit   (vi) Effluent suspended solids = 40 mg/lit

(vii) Waste sludge suspended solid = 12000 mg/lit   (viii) Quantity of waste sludge = 250 m³ /day

Based on above information, determine HRT, F/M, BOD removal efficiency and MCRT.

4. How does an oxidation pond work? Describe its construction with a neat sketch.

5. Design a septic tank and soak pit to dispose the sewage generated from a household of 8 persons. The

sewage is generated at the rate of 100 liters/person/day. Assume that, septic tank is cleaned once in 3 years and infiltration rate of soil is 50 liters/m²/day.

6. Discuss briefly the methods of land treatment. Explain sewage sickness and its prevention in brief.

7. With neat sketches, describe the theory, construction, commissioning and maintenance of an oxidation

Pond with its advantages and disadvantages.

*** All The Best***