

Name :

Roll No. :

Invigilator's Signature :

**CS/B.Tech(CE)/SEM-6/CE-603/2011
2011**

ENVIRONMENTAL ENGINEERING – II

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

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

GROUP – A

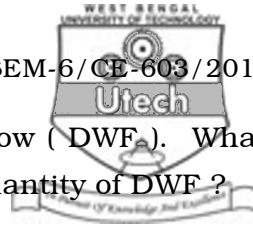
(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following : $10 \times 1 = 10$
 - i) Testing of sewer pipes may involve
 - a) water test
 - b) mirror test
 - c) ball test
 - d) all of these.
 - ii) In a circular sewer of dia D , if the depth of flow is $\frac{D}{4}$, the wetted perimeter will be equal to
 - a) $\pi \frac{D}{4}$
 - b) $\pi \frac{D}{2}$
 - c) $\pi \frac{D}{3}$
 - d) none of these.
 - iii) The gas, which is evolved in a sludge digestion tank, is mainly composed of
 - a) nitrogen
 - b) ammonia
 - c) hydrogen sulphide
 - d) methane.
 - iv) Pyrolysis is highly
 - a) endothermic
 - b) exothermic
 - c) both (a) and (b)
 - d) none of these.

- GROUP – B**

Answer any *three* of the following.

- a) Grit chambers
- b) Skimming tanks.



3. Find out the expression for dry weather flow (DWF). What are the different factors which affect the quantity of DWF ?
4. The BOD of a sewage is cubated for one day has been found to be 100 mg/lit at 30°C, what will be the 5 day BOD at 20°C ?
5. Compare between high rate and standard rate trickling filters.
6. What are the hydraulic characteristics of circular sewer sections running full or partially full.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. In continuous flow settling tank, 3.5 m deep and 65 m long, if the flow velocity of sewage observed as 1.22 cm/s, what size of particles of specific gravity 2.65 may be effectively removed ? Assume temperature 25°C and kinetic viscosity of water as $0.01 \text{ cm}^2 / \text{s}$.

Design a screen channel for a peak sewage flow of 45 million per day. Given

Size of bars = 15 mm × 50 mm

Clear spacing between bars 30 mm

Angle of inclination of screen with the horizontal 45°.

Diameter of incoming sewer 0.65 m. 6 + 9

8. a) Explain the terms : 'Population Equivalent' and 'Total Organic Carbon' (TOC).



- b) Calculate the following :
The organic carbon concentration of water that contains the following compounds :
- Glucose ($C_6H_{12}O_6$) : 200 mg/L
 - Benzene (C_6H_6) : 30 mg/L
 - Algae ($C_6H_{15}O_6N$) : 10 mg/L
- c) What is the weight formula of organic matter present in this solution ? 5 + 5 + 5
9. Write short notes on any *three* of the following : 3 × 5
- Activated sludge process
 - Comparative characteristics of trickling filters
 - Testing of sewer
 - Sewer appurtenance
 - Stability and relative stability
 - Functional elements of solid waste management
 - Detritus tank
 - Processing of solid waste.
10. a) What is the definition of BOD for a given sample of sewage ? Derive the expression for BOD for t days i.e., Y_t .
- b) The 5-day BOD at 20°C of a waste water is found to be 200 mg/L. Taking $k_1 = 0.15/\text{day}$, estimate the ultimate BOD. Also determine the 8-day BOD value at 15°C. 5 + 10
11. Design a septic tank having the following data :
- Number of users - 200
 - Rate of water supply — 150 lit/head/day
 - Detention period — 18 hours
 - Percolating capacity of filter media = 1250 lits/m³
- Also find the diameter of the soak-well. Assume reasonable data if required.
- [Assume any suitable data not provided] 10 + 5
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