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.

v) Average temperature of sewage in India is generally assumed to be

a) 20°C b) 30°C

c) 15°C d) 25°C.

vi) The ratio of BOD_5 to ultimate BOD is

a) 0·60 b) 0·68

c) 0·63 d) 0·75 .

vii) The BOD_5 of a sample is 300 mg/lit. The COD of the sample will be

a) > 1500 mg/lit b) 1000 mg/lit

c) 500 - 600 mg/lit d) 440 - 480 mg/lit.

viii) The value of the co-efficient of run off for perfectly impervious areas, tend to

a) zero b) 0·5

c) 1·0 d) infinity.

ix) The most suitable section of a sewer in a combined system is

a) rectangular b) circular

c) egg shaped d) none of these.

x) The secondary treatment of sewage is caused by

a) Bacteria b) Algae

c) Coagulants d) None of these.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. Define with neat sketch 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 250°C and kinetic viscosity of water as 0·01 cm^2 /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 :

i) Glucose ($C_6H_{12}O_6$) : 200 mg/L

ii) Benzene (C_6H_6) : 30 mg/L

iii) 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

a) Activated sludge process

b) Comparative characteristics of trickling filters

c) Testing of sewer

d) Sewer appurtenance

e) Stability and relative stability

f) Functional elements of solid waste management

g) Detritus tank

h) 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/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 :

a) Number of users - 200

b) Rate of water supply — 150 lit/head/day

c) Detention period — 18 hours

d) Percolating capacity of filter media = 1250 lits/m^3

Also find the diameter of the soak-well. Assume reasonable data if required.

[Assume any suitable data not provided] 10 + 5