ENVIRONMENTAL ENGINEERING-II (SEMESTER - 6)

CS/B.TECH (CE)/SEM-6/CE-603/09

1. .....
Signature of Invigilator

2. .....
Signature of the Officer-in-Charge

Reg. No. | | | | | | | | | | | | | | | |

Roll No. of the Candidate | | | | | | | | | | | | | | | |

CS/B.TECH (CE)/SEM-6/CE-603/09

ENGINEERING & MANAGEMENT EXAMINATIONS, JUNE – 2009

ENVIRONMENTAL ENGINEERING-II (SEMESTER - 6)

Time : 3 Hours] [Full Marks : 70

INSTRUCTIONS TO THE CANDIDATES :

1. This Booklet is a Question-cum-Answer Booklet. The Booklet consists of **32 pages**. The questions of this concerned subject commence from Page No. 3.
2. a) In **Group – A**, Questions are of Multiple Choice type. You have to write the correct choice in the box provided **against each question**.
   b) For **Groups – B** & **C** you have to answer the questions in the space provided marked 'Answer Sheet'. Questions of **Group – B** are Short answer type. Questions of **Group – C** are Long answer type. Write on both sides of the paper.
3. **Fill in your Roll No. in the box** provided as in your Admit Card before answering the questions.
4. Read the instructions given inside carefully before answering.
5. You should not forget to write the corresponding question numbers while answering.
6. Do not write your name or put any special mark in the booklet that may disclose your identity, which will render you liable to disqualification. Any candidate found copying will be subject to Disciplinary Action under the relevant rules.
7. **Use of Mobile Phone and Programmable Calculator is totally prohibited in the examination hall.**
8. You should return the booklet to the invigilator at the end of the examination and should not take any page of this booklet with you outside the examination hall, **which will lead to disqualification**.
9. Rough work, if necessary is to be done in this booklet only and cross it through.

No additional sheets are to be used and no loose paper will be provided

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Marks Obtained

	Group – A										Group – B			Group – C				
Question Number																	***Total Marks***	***Examiner's Signature***
Marks Obtained																		

.....

Head-Examiner/Co-Ordinator/Scrutineer

6729 (09/06)

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ENGINEERING & MANAGEMENT EXAMINATIONS, JUNE – 2009

ENVIRONMENTAL ENGINEERING-II

SEMESTER - 6

Time : 3 Hours] [Full Marks : 70

Assume reasonable value of additional data if required.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : 10 × 1 = 10

i) The ratio of BOD_5 to ultimate BOD is

a) 0·60 b) 0·68

c) 0·63 d) 0·75. ☐

ii) With increase in temperature of sewage dissolved oxygen content

a) decreases b) increases

c) remains unaffected d) none of these. ☐

iii) A water having pH = 9 will have hydroxyl ion concentration equals to

a) 10^{9} moles/lt b) 10^{-5} moles/lt

c) 10^{-9} moles/lt d) 10^{5} moles/lt. ☐

iv) The BOD_5 of a sample is 300 mg/l. The COD of the sample will be

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

c) 500 - 600 mg/l d) 440 - 480 mg/l. ☐

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

a) 20°C b) 30°C

c) 15°C d) 25°C. ☐

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vi) Pyrolysis is highly

a) endothermic

b) exothermic

c) none of these.

vii) Refuse generally consists of

a) human excreta and sullage

b) all solid and semi solid wastes excluding human excreta and sullage

c) human excreta

d) none of these.

viii) The range of average density of refuse for a typical Indian city is

a) 200 - 400 kg/m ^{3} b) 400 - 600 kg/m ^{3}

c) 600 - 800 kg/m ^{3} d) 800 - 1000 kg/m ^{3} .

ix) Hydraulic Mean Depth for a circular sewer is

a) D/2 b) D/4

c) 3D/4 d) D.

x) In India net quantity of sewage produced is taken as ..... on the accounted water supplied from the water works.

a) 75% b) 85%

c) 90% d) 60%.

xi) Amongst the various sewage treatment methods for the same discharge, the largest area is needed for

a) Trickling filter b) Anaerobic pond

c) Oxidation ditch d) Oxidation pond.

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xii) A primary sedimentation tank is not required for

a) activated sludge system

b) extended aeration system

c) trickling filtration system

d) tapered activated sludge process using pure oxygen for aeration. [ ]

xiii) Which one of the following types of setting phenomenon can be analysed by the classic sedimentation laws of tewton and stokes ?

a) Discrete settling b) Flocculent settling

c) Hindered settling d) Compression settling. [ ]

xiv) The detention period adopted for sewage sedimentation tanks is of the order of

a) 1 - 2 hours b) 4 - 8 hours

c) 8 - 16 hours d) 24 - 36 hours. [ ]

xv) Sewage treatment plants are generally designed for

a) maximum flow only

b) minimum flow only

c) average flow only

d) both maximum flow and minimum flow. [ ]

xvi) Testing of sewer pipes may involve

a) water test b) mirror test

c) ball test d) all of these. [ ]

GROUP – B

(Short Answer Type Questions)

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

2. Given Q = 80 MLD, BOD_5 = 285 mg/l, calculate the total daily 5 day oxygen demand in kg and also the population equivalent of the sewage. Assume the per capita BOD of sewage per day as 75 g.

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3. Derive the expression for BOD for t days *i.e.* Y_t .

4. State the characteristics of domestic sewage in respect of any *five* of the following :

   a) Colour

   b) pH

   c) Odour

   d) Total solids

   e) Settleable solids

   f) BOD.

5. What are the major advantages and disadvantages of trickling filter ?

6. A catchment area consists of the following sources :

   a) Cultivated area = 50 hectares (p = 0·20)

   b) Forest Area = 30 hectares (p = 0·10)

   c) Garden = 5 hectares (p = 0·05)

   d) Residential area = 15 hectares (p = 0·50)

   Find the run-off coefficient of the area.

7. Describe the disposal process of solid waste by composting method.

8. Describe the irrigation and farming activities in the technique of disposal of sewage.

GROUP – C

(Long Answer Type Questions)

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

9. a) What do you understand by 'Storm Water' ?

   b) How can you determine the dry weather flow (DWF) ?

   c) A catchment area of 20 km^2 consists of two-third rural and one-third urban area. The rainfall intensity in the area is recorded as 25 mm/hr. Find the quantity of storm water in the area in lits/sec. K for rural area = 0·30, K for urban area = 0·50. 2 + 3 + 10

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10. Design the diameter of combined sewer having the following data :

a) Area = 500 hectares

b) Population = 1,00,000

c) Water supply = 50lit/capita/day

d) Intensity of rainfall = 15 mm/hr

e) Impermeability factor = 0·50

f) Max. permissible velocity = 2·0 m/sec.

Assume reasonable data if necessary. 15

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) Sludge storage capacity = 20 lit/person/day

e) Effective depth of required.

Assume reasonable data, if required. 15

12. a) The BOD of a sewage incubated for one day at 30°C has been round to be 120 mg/lit. What will be its 5 days 20° BOD if the values of reaction constant K_1 are 0·1 and 0·16 respectively at 20°C and 30°C.

b) The 5-day BOD at 20°C of waste water is found to be 200 mg/lit. K_1 = 0·15/day. Estimate the ultimate BOD also determine the 8-day BOD value at 15°C. 8 + 7

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13. Write short notes on any *three* of the following : 3 × 5

a) Infiltration

b) Skimming tank

c) Oxidation pond

d) Detritus tank

e) Carbon cycle

f) Stability and relative stability

g) Sludge digestion.

14. a) What do you understand by normal rate trickling fitters and high rate trickling filters ?

b) Describe the comparative characteristics between these two types of trickling filter.

c) Describe the activated sludge process ? 5 + 5 + 5

END

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