Bachelor of Civil Engineering (Part Time) Examination 2018

(4th Year 1st Semester)

Waste Water Engineering

Time: Three Hours

Full Marks: 100

Use separate answer script for each part

(50 marks for each part)

Part-1

Answer **Question No. 1** and any **Two** from the rest. Answers should be brief. Any relevant data may be assumed, if needed. Please answer Question No 1 in first few pages of your answer script.

1. a) Correlate waste water(WW) treatment and poor solubility of oxygen.

    b) Name two WW parameters which are not generally expressed in mass by volume basis.

    c) Mention the basic natures of those organic compounds which can be magnified biologically?

    d) Why are the chemo heterotrophic bacteria chosen as main tool for biodegradation?

    e) Name the general effluent standards (CPC B) for disposal of municipal WW.

    f) Compare BOD and BOD_5.

    g) Why are nutrients sometimes removed from waste water?

    h) Compare COD, TOC, BOD_5, ThOD and BOD_u.

    i) What is worst condition for calculation of ground water infiltration?

    J) Define 'time of concentration'.

    2x10=**20**

Ref No: EX/CE/5/T/ᴸ

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                                                                                                      Full Maɪ

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2.   a)   Classify total solids based on volatility and explain the significance of this classification . Desçribe

            transformation of volatile solids in biological units of WW treatment plant. Explain the significanc

            secondary sedimentation plant.

      b)   (i) Which physical WW characteristic (WWC) is most important for siting a STP?

            (ii) Name two important physical water qualities which are not very important WWCs.

            (iii) Which physical WWC is most responsible for septicity of a tropical water body?

            (iv) What is the relevant effluent standard for temperature?

            (v) What is the colour of WW with which we are familiar with and what is responsible for that coh

      c)   'Turbidity is only qualitatively related with suspended solids'-- explain.   8+5+:

3.   a)   Show how the 'BOD exertion' and 'BOD remaining' curves are mirror images of each other.

      b)   Enlist and explain the factors affecting BOD rate constant.

      c)   Describe the reasons for performing following steps during BOD test

            (i) dilution (ii) seeding (iii) incubation (iv) using buffers   4+3+8 =

: EX/CE/5/T/4

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on . Describe

the significanc

a) Develop the expressions for discharge and velocity for circular pipe 'flowing full' conditions from Manning's Equation.

b) Following database for analyzing an existing sewer are given:

s.

(i) Ultimate peak flow = 500 lps (ii) Present peak flow 400 lps (iii) Dia = 1050mm (iv) n = n' = 0.013

(v) d/D at present peak flow = 0.80

Calculate Q, V, S, and v at ultimate peak flow and v at present peak flow. Following table may be needed:

le for that col

8+5+2

d/D	v/V	q/Q
1.000	1.000	1.000
0.900	1.124	1.066
0.800	1.140	0.988
0.700	1.120	0.838
0.600	1.072	0.671
0.500	1.000	0.500
0.400	0.902	0.337

ther.

4+3+8 =

All the notations used in this problem have usual meanings.

b) Explain the followings with respect the table given in Q4 (a):

(i) at d/D =0.9, q/Q >1.0 (ii) d/D should be 0.8 and (iii) d/D should not be less than 0.5.

4+8+3 = 15

B.E. (Civil Engg.) (Part Time) 4ᵗʰ YEAR 1ˢᵗ SEMESTER EXAMINATION, 2018
(1ˢᵗ / 2ⁿᵈ Semester /~~Repeat~~/ ~~Supplementary~~ / ~~Annual~~ /~~Biannual~~)

SUBJECT: WASTEWATER ENGINEERING
(Name in full)

Full Mar Time:

Time: ~~Two hours~~/Three hours/~~Four hours~~/ ~~Six hours~~   (50 marks for eac

No
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Use a separate Answer-Script for each part

No. of Question	Part-II	M;
	Answer Question-1 and 2 and any *two* from the rest	
Q.1)	**A. Fill in the blanks with appropriate word(s):**	(1*
	i. The treatment units where removal of pollutants occurs through chemical and biochemical reactions are called ---------------.	
	ii. Large screen has opening size greater than ----------- mm.	
	iii. Removal of non-biodegradable organics usually occurs in the ------------- treatment units.	
	iv. In activated sludge process the value of SRT varies in the range of -------- days.	
	v. MLSS is the acronym of --------------------.	
	vi. Greasy matters when combine with detergent form----------------.	
	vii. Growth of ---------------- in upper reaches of a trickling filter adds oxygen to the percolating wastewater.	
	viii. ------------- equation is used for calculating head loss of a bar screen.	
	B. State whether the under-mentioned statements are True or False with necessary justifications:	(2*3)
	i. **Efficiency** of a skimming tank is reduced significantly by passing **chlorine gas** along with air bubbles.	
	ii. In activated sludge process **hydraulic retention time** is usually smaller than **mean cell residence time (MCRT)**.	
	iii. **Sloughing** in trickling filter is only a function of **organic loading rate** of the filter.	
Q.2)	a) What are the significances behind the treatment of wastewater?	4
	b) What are the adverse effects that will be caused if a grit chamber is not provided in the sewage treatment plant?	3
	c) Differentiate between **Hydraulic Retention Time (HRT)** and **Mean Cell Residence Time (MCRT)**.	4
	d) What do you mean by **settleability of sludge**? How it is expressed and measured?	(2+3)

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CE/5/T/40
2018

Ref No. Ex/CE/5/T/402/2018

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(1ˢᵗ / 2ⁿᵈ Semester / Repeat / Supplementary / Annual / Biannual)

SUBJECT: WASTEWATER ENGINEERING
(Name in full)

Full Marks:100
(50 marks for each part)

Full Mar ime: Two hours/Three hours/Four hours/ Six hours
s for eacl

No. of Question	Part-II	Marks
Q.3)	Design a **screen chamber** on the basis of following data: i) Peak Design Wet Weather Flow = 1.295 m³/sec ii) Velocity through screen at peak design wet weather flow condition = 0.9 m/sec. iii) Population of the township = 2,50,000 iv) Depth of flow in the incoming conduit at peak design flow condition=1.15m Consider head loss at both no-clog and 55% clogged condition, and the inclination of the bar 70° with horizontal.	10
Q.4)	A township having a population of **70,000** persons is producing domestic sewage @ **120 lpcd** having an average **215 mg/l** of BOD₅. Design a high rate single stage **trickling filter** for treating the sewage. Assume that the primary clarifier removes **35%** of BOD. Given: i) Organic Loading rate = **6219 Kg/hec-m/day** ii) Surface Loading rate = **128 million-litre/hec/day** (including re-circulated sewage) iii) Recirculation Ratio = **1.20** iv) Desired BOD₅ in the final effluent = **30 mg/l.**	10
Q.5)	a) *"Flocculation capacity of biomass is minimum during exponential phase of biomass growth"*- Justify this statement. b) Design a **secondary clarifier** for an activated sludge process for an average flow of 22 million-litre per day (MLD) and peak flow of 42 MLD, operating with a MLSS concentration of 3150 mg/L. Considering a circular tank find out the dimensions. Exercise the necessary checks.	3 7