

Supplementary Examination

Feb-2019

CE 309: ENVIRONMENTAL ENGINEERING DESIGN

Maximum Marks 50

Time 3 hours

Attempt FIVE questions. Attempt at least 2 questions from each section. All questions are of 10 marks.

Make necessary assumptions wherever required and clearly state them.

SECTION A

1. Write explanatory note on any FOUR of the following:
 - a. Control of hydrogen sulphide emissions of wastewater treatment plants
 - b. Nitrogen control in wastewaters
 - c. Corrosion control
 - d. Air stripping for ammonia removal from wastewaters
 - e. Principle of optimality in deterministic dynamic programming.
 - f. Design criteria of aerators.

(2.5X4=10)

2. An environmental research company has 8 units of money available for exploration of three technologies. For one of the technology to be viable, the probability of finding it depends upon the amount allocated for exploiting the technology, as given below

Units of money	0	1	2	3	4	5	6	7	8
Technology 1	0	0	.1	.2	.3	.5	.7	.9	1
Technology 2	0	.1	.2	.3	.4	.6	.7	.8	1
Technology 3	0	.1	.1	.2	.3	.5	.8	.9	1

The probability that the technology 1, 2, 3 is viable is .4, .3, .2 respectively. Find optimal allocation of money.

(10)

3. Solve the following formulated L.P.P.

$$\begin{aligned} \text{MAX. } Z &= 5X_1 - 2X_2 + 3X_3 \\ \text{S.T. } 2X_1 + 2X_2 - X_3 &\geq 2 \\ 3X_1 - 4X_2 &\leq 3 \\ X_2 + 3X_3 &\leq 5 \end{aligned}$$

All variables in above problem are non-negative.

(10)

4. Solve the following two variable unconstrained non-linear problem using search procedure :

$$f(x) = 2x_1x_2 + x_2 - x_1^2 - 2x_2^2$$

(10)

P.T.O.

SECTION B

- 5.
- a. Write the concept design of Renny wells.
 - b. An oxidation ditch activated sludge system is to treat 7.5 MLD of municipal wastewater having BOD_5 of 200 mg/l and no primary treatment is provided. The oxidation ditch is 3m deep, 7m wide and 400m long, with MLSS OF 1800 mg/l. The value of Y is determined to be 0.5kg/kg and value of k_d is found to be 0.06 per day. Determine the mean cell residence time if the residual BOD requirement is (1) 10 mg/l (2) 20 mg/l.
- (3+7=10)
- 6.
- a. In a Bio-tower type wastewater treatment plant, primary and secondary sludges are mixed and thickened in a gravity thickener and then treated by two stage anaerobic digestion. Draw a flow diagram in schematic form and label the typical characteristics of wastewater and sludge at different stages. Also indicate the approximate size of each unit for a municipal wastewater flow of 10 MLD.
 - b. Explain the detailed design procedure for Secondary clarification.
- (7+3=10)
- 7.
- a. Explain the use of EPANET for discharge distribution and head loss computations
 - b. Explain the role of mechanical aeration with suitable case study/example along with typical data in (1) water treatment and (2) wastewater treatment.
- (3+7=10)

END