BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI
FIRST SEMESTER 2015-2016
MID-SEMESTER TEST (OPEN BOOK/NOTES)

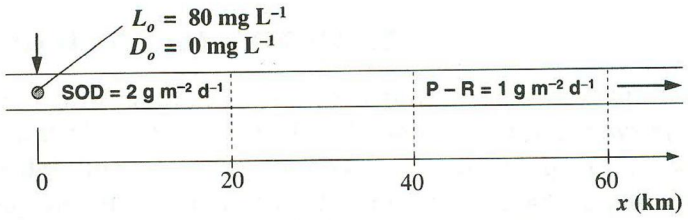
COURSE NO.: CE G525 TIME: 90 Min.
COURSE TITLE: Water Resources Planning and Management DATE: 05/10/2015
MAX. MARKS: 30%

Note: (i) Attempt all questions.
(ii) Make necessary assumptions, if required.

Q.1 What do you understand by self-purification property of a stream? Explain the factors affecting this property.

A large stream has reoxygenation rate constant of 0.4 day^{-1}. At a point in this stream, a wastewater drain is meeting which has a dissolved oxygen concentration of 1.5 mg/L, a flow of 0.5 m^3/s, a temperature of 26^0C, and an ultimate biochemical oxygen demand (BOD) of 48 mg/L. The stream water is running at 2.2 m^3/s at a saturated dissolved oxygen concentration, a temperature of 12^0C, and an ultimate BOD of 13.6 mg/L. Calculate the dissolved oxygen concentration 48.3 km downstream by assuming deoxygenation rate constant as 0.2 day^{-1}. Also assume that the saturated dissolved oxygen concentration at 12 ^{o}C, 14 ^{o}C and 15 ^{o}C as 10.83 mg/L, 10.37 mg/L and 10.15 mg/L respectively. (7.5 M)

Q.2 A river is subjected to a point source of BOD and diffuse sources of oxygen deficit, as shown in Fig. Q.2. Compute the BOD and oxygen concentration at 20 km, 40 km and 60km downstream from the origin points as shown in the Figure Q.2. Assume k_d = rate of BOD removal (dissolved form only) coefficient; k_r = rate of overall BOD removal (both settling and dissolved form) coefficient; k_a = rate of aeration coefficient; o_s = saturated dissolved oxygen concentration; H = depth of river water; U = stream velocity; L_o = initial BOD concentration; D_o = initial DO deficit.



U (mps)	0.1	0.15	0.1
H (m)	0.8	1	1
k_r (d^{-1})	0.2	0.1	0.1
k_d (d^{-1})	0.1	0.1	0.1
k_a (d^{-1})	1	1.2	1.2
o_s (mg L^{-1})	10	9	8

(7.5 M)

(P.T.O.)

Q.3(a) A wastewater contains 1.67 x 10^{-3} M glucose ($C_6H_{12}O_6$). Find the theoretical oxygen demand for the wastewater. Neglect the effects of other parameters present in water. (3.0 M)

Q.3(b) Biochemical oxygen demand (BOD) and theoretical oxygen demand (ThOD) for selected chemical wastes are presented in the following table. Which chemical waste listed in the table is the most likely to be biologically degradable and why? (3.0 M)

	BOD (g/g)	ThOD (g/g)
Chemical waste A	2.15	2.52
Chemical waste B	1.34	2.15
Chemical waste C	1.85	1.92
Chemical waste D	1.64	2.91

Q.4(a) What do you understand by complete-mix reactor and plug-flow reactors. Compare point-wise. (2.0 M)

Q.4(b) Are rivers usually more susceptible to dissolved oxygen depletion in the summer or in the winter? Briefly explain it by providing at least two reasons for your answer. (3.0 M)

Q.5 Discuss the philosophy behind potential assessment of water resources development with reference to water availability, demand, challenges, opportunities and other characteristics which you feel are essential. (4.0 M)

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