JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION - 2018

B.Tech VIII Sem./M.Tech II Semester

COURSE CODE: 14M31CE215 **MAX. MARKS: 35**

COURSE NAME: SURFACE WATER QUALITY MANAGEMENT

COURSE CREDITS: 03 **MAX. TIME: 2 Hr**

Note: All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means.

Q1. a) What are the objectives of undertaking surface water quality monitoring? Under surface water quality management plan, what procedure you would follow to assess the nature and magnitude of the pollution in a river water body. [02 Marks]

b) Distinguish between: **[04 Marks]**

i) Baseline Station and Trend Station

ii) Time-Composite and Flow-Composite sample

c) Provide information on sample collection method, container type, preservation and holding time for the following parameters: **[03 Marks]**

Parameter	Sample collection method	Container type	Preservation	Holding time
Total Suspended Volatile Solids				
Kjeldahl Nitrogen				
Chlorophyll a				

Q2. a) What are the various options available for restoration of water quality in surface water bodies? Emphasize your answer on waste minimization and clean technologies **[2.0 Marks]**

b) Write a note on Ganga Action Plan **[2.0 Marks]**

Q3. a) What are the assumptions made in deriving the DO-BOD relationship in streams (Streeter – Phelps Model). What are the limitations of the model? **[03 Marks]**

b) A paper manufacturing industry discharges its wastewater to a stream. Characteristics of the wastewater and the stream are shown below: **[06 marks]**

Parameter	Wastewater	Stream
Flow	1000 m^3/d	19000m^3/d
BOD_5 @ 20°C	1250 mg/L	2.0 mg/L
DO	0 mg/L	10.0 mg/L
Temperature, °C	50	10
K_1 @ 20°C	0.35/day	
K_2 @ 20°C		0.55/day

i) If no treatment at all is given to the wastewater, what will be the lowest oxygen level in the stream as a result of the discharge?

ii) If the stream is a trout fishery and the stream standards require a minimum DO of 5 mg/L. what is the maximum BOD_5 (20°C) that can be discharged by the industry?

iii) Sketch the DO Concentration profile a 100-km reach of the stream below the discharge for treated wastewater.
(Assume velocity of the mixture as 0.25 m/s)

Q4.a) What do you mean by "Eutrophication" and what are the factors responsible for Eutrophication of lakes. **[03 Marks]**

b) How do you measure water clarity/turbidity in surface waters? Give description of the equipment used with the help of a neat sketch. **[02 Marks]**

Q5.a) How thermal stratification in lakes affects DO. Discuss with the help of neat figures. **[02 Marks]**

b) Discuss the sampling procedures adopted for water quality monitoring in lakes **[02 Marks]**

c) Determine the DO concentration in the completely mixed lake and show mass balances for CBODU and DO. Assume effluent is at lake's DO saturation **[04 Marks]**

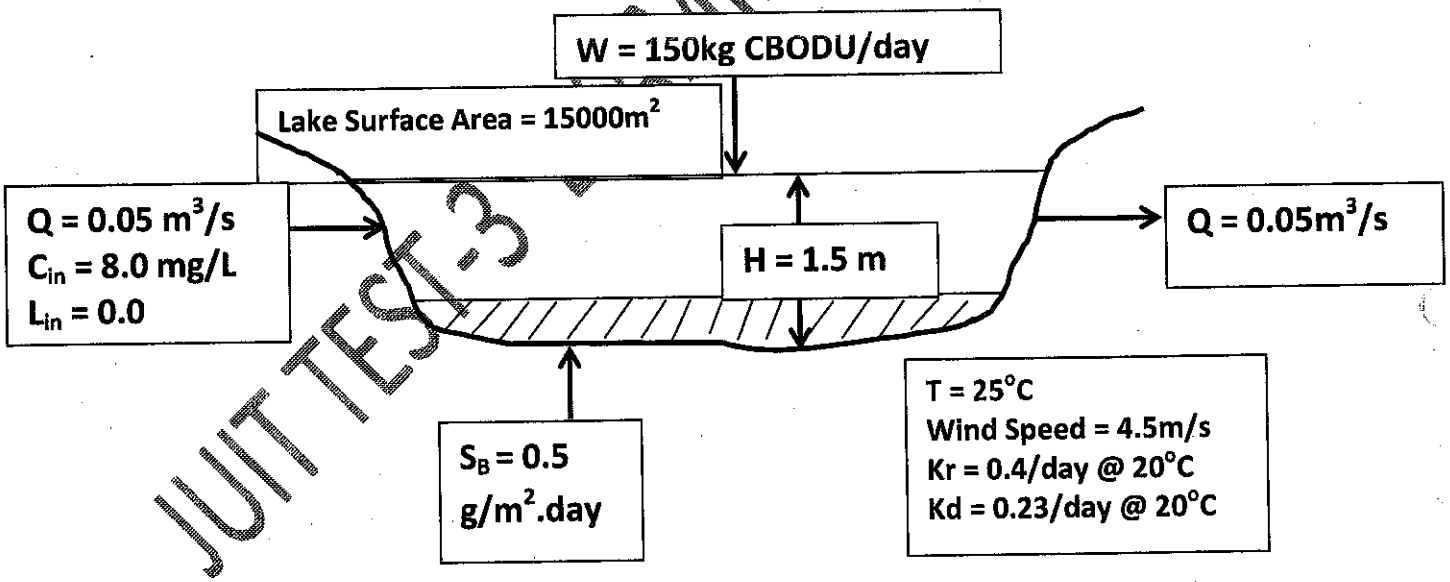

Table C-3 Equilibrium concentrations (mg/L) of dissolved oxygen* as a function of temperature and chloride

Temperature, °C	Chloride concentration, mg/L				
	0	5,000	10,000	15,000	20,000
0	14.62	13.79	12.97	12.14	11.32
1	14.23	13.41	12.61	11.82	11.03
2	13.84	13.05	12.28	11.52	10.76
3	13.48	12.72	11.98	11.24	10.50
4	13.13	12.41	11.69	10.97	10.25
5	12.80	12.09	11.39	10.70	10.01
6	12.48	11.79	11.12	10.45	9.78
7	12.17	11.51	10.85	10.21	9.57
8	11.87	11.24	10.61	9.98	9.36
9	11.59	10.97	10.36	9.76	9.17
10	11.33	10.73	10.13	9.55	8.98
11	11.08	10.49	9.92	9.35	8.80
12	10.83	10.28	9.72	9.17	8.62
13	10.60	10.05	9.52	8.98	8.46
14	10.37	9.85	9.32	8.80	8.30
15	10.15	9.65	9.14	8.63	8.14
16	9.95	9.46	8.96	8.47	7.99
17	9.74	9.26	8.78	8.30	7.84
18	9.54	9.07	8.62	8.15	7.70
19	9.35	8.89	8.45	8.00	7.56
20	9.17	8.73	8.30	7.86	7.42
21	8.99	8.57	8.14	7.71	7.28
22	8.83	8.42	7.99	7.57	7.14
23	8.68	8.27	7.85	7.43	7.00
24	8.53	8.12	7.71	7.30	6.87
25	8.38	7.96	7.56	7.15	6.74
26	8.22	7.81	7.42	7.02	6.61
27	8.07	7.67	7.28	6.88	6.49
28	7.92	7.53	7.14	6.75	6.37
29	7.77	7.39	7.00	6.62	6.25
30	7.63	7.25	6.86	6.49	6.13

TABLE 3.4 The Complementary Error Function[a]

x	erfc(x)	x	erfc(x)
0	1.0		
0.05	0.943628	1.1	0.119795
0.1	0.887537	1.2	0.089686
0.15	0.832004	1.3	0.065992
0.2	0.777297	1.4	0.047715
0.25	0.723674	1.5	0.033895
0.3	0.671373	1.6	0.023652
0.35	0.620618	1.7	0.016210
0.4	0.571608	1.8	0.010909
0.45	0.524518	1.9	0.007210
0.5	0.479500	2.0	0.004678
0.55	0.436677	2.1	0.002979
0.6	0.396144	2.2	0.001863
0.65	0.357971	2.3	0.001143
0.7	0.322199	2.4	0.000689
0.75	0.288844	2.5	0.000407
0.8	0.257899	2.6	0.000236
0.85	0.229332	2.7	0.000134
0.9	0.203092	2.8	0.000075
0.95	0.179109	2.9	0.000041
1.0	0.157299	3.0	0.000022

$$\text{erfc}(x) = 1 - (2/\sqrt{\pi}) \int_0^x e^{-\epsilon^2} d\epsilon$$

$$\text{erfc}(-x) = 2 - \text{erfc}(x)$$

[a] *Adapted from Freeze and Cherry (1979).*