University Of Technology
Building and Construction Eng. Dept.
Final Exam – First Attempt – 2010/2011

Branch : Structural Engineering   Class: 3th Year
subject : Sanitary Engineering   Time : 3 Hours
Examiner : Dr. Faris Hammoodi   Date : 15-6-2011

Note: Answer five (5) questions only.

Q1- A wastewater effluent of (0.56) m3/sec and have a BOD5 of (50) mg/l, DO (3) mg/l, and temperature of (23) °C enters a river of (2.8) m3/sec flow with a BOD5 of (4) mg/l, a DO of (8.2) mg/l, and temperature of (17) °C. If the saturation concentration (Cs) is (9.5) mg/l calculate the minimum dissolved oxygen level and its distance downstream if the velocity (0.18) m/sec. K1 is (0.23)/day at (20) °C and K2 is (0.69) /day at (20) °C.

Q2- A) Explain the theory of filtration.

B) In an ideal sedimentation tank prove that:
Surface overflow rate (SOR) = Flow (Q) / Surface area (As).

Q3- A) There are various physical factors affect process of self-purification of stream (positive or negative) what are these factors and what are there effects?

B) A rapid filter plant is to treat (23000) m3/ day at a rate of (120) m/day. Determine the size and number of units required if the filtration rate is not to exceed (180) m/day with one filter being backwashed, nor (240) m/day with one filter out of service and one filter being backwashed. How much water would be required to backwashed one filter if the wash is at (1) m/min and continuous for (10) minute.

Q4- Explain the followings:

1- The characteristics of sand and gravel used in filter media.
2- Biochemical Oxygen Demand (BOD).
3- Pre-chlorination.
4- The factors that affect the coagulation process.
5- Types of water intakes and the points that must be considered when it located.

Q5-Determine the overall removal of a settling basin for a suspension with the particle size distribution given below if the surface overflow rate is (30) m/day. The mass density of the particles (ps) is (1.2) and of water (p) is (0.997) gm. /cm3, and absolute viscosity (u) is (1.02) centipoise (cP).

(Note: 1 cP = 0.01 gm. /cm.sec, and g is (9800) mm/sec2.)

Particle size, mm	0.15	0.1	0.085	0.075	0.06	0.03	0.015
Weight fraction greater than size (percent)	10	15	35	65	80	95	100

Q6- A) What are colloidal properties? And explain with drawing the theory of the double layer which forms around colloidal particles.

B) What are the physical and chemical characteristics of wastewater? Explain.