FACULTY OF CIVIL ENGINEERING, UTM
SKAA 2922 WASTEWATER ENGINEERING
SEM 2017/2018-1

TEST 1

1 HOUR

ANSWER ALL QUESTIONS

PART A

1.   Briefly describe the role of microorganisms in wastewater treatment.

(3 marks)

2.   Solids are one of the main physical characteristics being investigated for wastewater. Describe how solids mainly suspended solids can presence in the wastewater.

(2 marks)

3.   What is meant by Standard A and Standard B in the Environmental Quality (Sewage) Regulations 2009? What is the purpose of these regulations?

(3 marks)

PART B

1.   A 50 mL sample was placed on 54.345 g empty dish and heated at 103 - 105°C for 1 hour. After heating, the residual solids concentration was found to be 760 mg/L. The sample was further ignited at 550°C, at which 380 mg/L solids was volatized. Another 100 mL sample was filtered through 1.963 g filter paper. After drying at 103 - 105°C, the remaining solids concentration retained on the filter was 260 mg/L. The sample was also further ignited at 550°C, at which 150 mg/L solids was volatized. Calculate:

  (a) Total fixed solids
  (b) Fixed suspended solids
  (c) Weight of drying dish + residue after drying at 103 - 105°C
  (d) Weight of drying dish + residue after ignition at 550°C
  (e) Weight of filter paper + residue after drying at 103 - 105°C
  (f) Weight of filter paper + residue after ignition at 550°C

(8 marks)

2. The BOD analysis was performed on a municipal wastewater at 30°C. The data obtained from the experiment was plotted as in Figure 1.0.
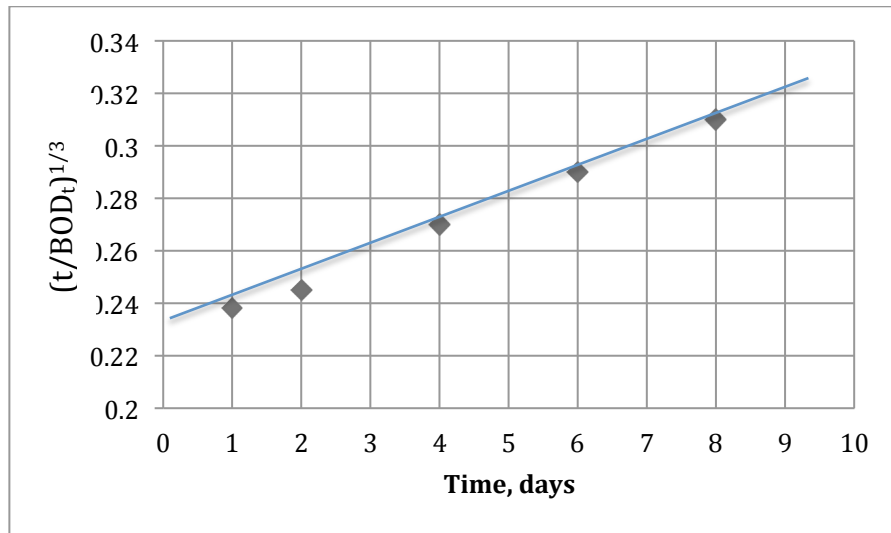

Figure 1.0

(a) Determine the BOD rate constant, K.
(b) Determine the BOD_3 of the sample at 30°C.
(c) Determine the dilution factor used in the experiment if 6.5 mg/L of dissolved oxygen were consumed by bacteria over 3-day incubation period.
(d) Determine the BOD_5 at 20°C.
(e) Assume the COD value of the sample and justify your answer.

(9 marks)

3. Mutiara Resort City development is proposed on 400 ha land. The development comprises a 1000-room luxury hotel, 500 units of private apartments, a commercial building with 500 shop lots (8m x 4m/lot), and a 27-hole golf course. Calculate the average daily flow and peak flow in m^3/d for the above development. (PFF = 4.7 $(p)^{-0.11}$)

(5 marks)

Table 1.0 Population Equivalent Design Value for Premises

Type of Establishment/Premise	Population Equivalent (PE)
Residential	5 per house
Commercial	3 per 100m2 area
Hotels	4 per room
Factories	0.3 per employee
Mosque	0.5 per person
Golf Course	20 per hole

$$L_o = \frac{BOD_t}{(1-10^{-Kt})} \qquad L_o = \frac{BOD_t}{(1-e^{-kt})} \qquad BOD_t = \frac{DO_0 - DO_t}{P} \qquad k_T = k_{20} \; x \; 1.047^{(T-20)} \qquad K = 2.61(B/A)$$