SCHOOL OF CIVIL ENGINEERING
FACULTY OF ENGINEERING, UTM
SKAB 2922 WASTEWATER ENGINEERING
SEM I 2018/2019

TEST 2 **1 HOUR**

ANSWER ALL QUESTIONS

Part A

1. Draw and label a complete flow diagram of a sewage treatment plant consist of a conventional activated sludge system. Choose TWO (2) of the processes and state their function.

(5 marks)

2. What are the TWO (2) differences between an extended aeration system as compared to a conventional activated sludge system.

(3 marks)

3. What is the importance of having an anoxic tank in a sewage treatment plant? Explain denitrification process in anoxic tank.

(3 marks)

Part B

1. A sewage treatment plant is designed to treat wastewater from a population of 50,000 PE. Two (2) circular clarifiers are aligned in parallel and having 3.5 m side water depths. Single effluent weirs are located on the peripheries of the tanks, with a weir loading of 200 m^3/m.d at peak flow.

   Based on the information given, determine:

   a) Diameter of each clarifier
   b) Hydraulic Retention Time (HRT) at peak flow
   c) Surface overflow rate at peak flow

(7 marks)

2. An activated sludge system is designed to treat wastewater from a population of 40,000 PE. The wastewater that enters into the aerated reactor with BOD_5 of 180 mg/L has to be reduced to comply with Standard A. Volume of the reactor used is 1700 m^3 and the biomass concentration in the reactor is maintained at 2900 mg/L. The volume of biomass to be wasted is 110 m^3 in a day and has a concentration of 8500 mg/L. Determine:

a) BOD removal efficiency
b) Hydraulic retention time for aeration tank
c) F/M ratio
d) Mean cell residence time
e) Draw the diagram, label and show the mass balance around the secondary clarifier.

Prove $Q_r = \frac{QX - Q_w X_u}{X_u - X}$ and determine the sludge recycle ratio

(12 marks)

$PFF = 4.7\ (p)^{-0.11}$

$$\frac{F}{M} = \frac{Q_o S_o}{\forall X} \qquad \forall_L = \frac{Q_o S_o}{\forall}$$

$$t_c = \frac{\forall X}{Q_w X_u} \qquad \frac{1}{t_c} = \frac{Y(S_o - S)}{tX} - k_d$$