



MASENO UNIVERSITY
UNIVERSITY EXAMINATIONS 2013/2014

FIRST YEAR SECOND SEMESTER EXAMINATIONS FOR THE
DEGREE OF MASTER OF SCIENCE IN ENVIRONMENTAL
SCIENCE
(HOMA BAY CAMPUS)

NES 827: FRESH WATER QUALITY AND ECOSYSTEM

Date: 5th April, 2014

Time: 8.00 - 11.00 a.m.

INSTRUCTIONS:

- Answer ANY FOUR questions.
- All questions carry equal marks.



(HOMA- BAY LEARNING CENTRE)
FIRST YEAR SECOND SEMESTER 2013 - 2014
NES 827: FRESH WATER QUALITY AND ECOSYSTEM

TIME : 3 Hours

INSTRUCTIONS : Answer any FOUR questions.

1. Etabu and Asila (1983) presented the following data related to the solid budget for Lake Nakuru
Volume = $1666 \times 10^9 \text{ m}^3$ Suspended solids concentration = 0.5 mg L^{-1}
Solids loading = $4.46 \times 10^{12} \text{ g yr}^{-1}$ Flow = $212 \times 10^9 \text{ m}^3 \text{ yr}^{-1}$
Area = $19,485 \times 10^6 \text{ m}^2$
They assumed that the solid settle at a rate of 2.5 m d^{-1} (912.5 m yr^{-1}) and that the sediments have $\rho = 2.4 \text{ g cm}^{-3}$ and $\phi = 0.9$. determine the burial and resuspension velocity by a mass balance approach. (15mks)
2. Discuss different methods applied in aquatic weed management (15mks)
3. Kisumu Municipal wastewater treatment plant serving 200,000 people discharges $1.10 \text{ m}^3/\text{s}$ of treated effluent having an ultimate BOD of 50.0 mg/L into River Kisat that has a flow of $8.70 \text{ m}^3/\text{s}$ and BOD of its own equal to 6.0 mg/L . The deoxygenation constant k_d is $0.20/\text{day}$.
 - a. Assuming complete and instantaneous mixing, calculate the ultimate BOD of the river just downstream from the outfall. (8mks)
 - b. If the river has constant cross section so that it flows at a fixed equal to 0.30 m/s , calculate the BOD of the river at a distance $30,000 \text{ m}$ downstream. (7mks)
4. A lake with surface area equal to $80 \times 10^6 \text{ m}^2$ is fed by a stream having an average flow of $15.0 \text{ m}^3/\text{s}$ and an average total phosphorus concentration of 0.010 mg/L . In addition, treated affluent from a wastewater treatment plant adds $0.20 \text{ m}^3/\text{s}$ of flow having 5.0 mg/L total phosphorous. The phosphorous settling rate is estimated at 10 m/year .
 - a. Calculate the average total phosphorous concentration. (7mks)
 - b. What rate of phosphorous removal at the wastewater treatment plant would be required to keep the concentration of phosphorous in the lake at an acceptable level of 0.010 mg/L ? (8mks)
5. Explain briefly the adaptation features of stream fish. (15mks)
6. Water hyacinth is more of a "devil" than an "angel". Justify the above statement. (15mks)