UNIVERSITY OF SWAZILAND
Faculty of Health Sciences

DEGREE IN ENVIRONMENTAL HEALTH
FINAL EXAMINATION PAPER 2005

TITLE OF PAPER	:	**WATER RESOURCES MAMAGEMENT**
COURSE CODE	:	EHS 541
DURATION	:	3 HOURS
MARKS	:	100
INSTRUCTIONS	:	READ THE QUESTIONS & INSTRUCTIONS CAREFULLY
	:	ANSWER ANY **FIVE** QUESTIONS
	:	EACH QUESTION CARRIES 20 MARKS.
	:	WRITE NEATLY & CLEARLY
	:	NO PAPER SHOULD BE BROUGHT INTO OR OUT OF THE EXAMINATION ROOM.
	:	BEGIN EACH QUESTION ON A SEPARATE SHEET OF PAPER.

DO NOT OPEN THIS QUESTION PAPER UNTIL PERMISSION IS GRANTE BY THE INVIGILATOR.

QUESTION ONE

1. What do you understand by Integrated Water Resources Management? (5)
2. Mention five dimensions of integrated water resources management? (5)
3. What does sustainable use of water resources mean? (3)
4. Mention five demand-oriented measures in water resources management. (5)
5. Mention two advantages of an increasing block rate as opposed to flat rate in water tariffs (2)

QUESTION TWO

1. What are the components of a robust plan and what are the advantages of linear planning method over cyclic planning? (11)
2. Give an estimate of the amount of "virtual" water that is equivalent with the production of 70kg of maize. If a ton of maize was exported to Mozambique how much virtual water is exported? (5)
3. Mention two consumptive uses and two non-consumptive water uses. (4)

QUESTION THREE

1. Why are population forecasts important for water resources management? (3)
2. In a certain country, the President proudly presented the latest population statistics: the total population P = 50 million people, the fertility rate f = 2 average death rate of d = 1, and the population growth rate 3%.
    1. What is the average life expectancy? (4)
    2. What percentage of people dies each year? (4)
    3. How many children are there per woman? (4)
    4. How long will it take the population to double? (5)

QUESTION FOUR

1. What make water an important resource above all other natural resources? **(Give five reasons for this)** (5)
2. Give five factors that contribute to global water shortage. (5)
3. Global water shortage is a recipe for international conflicts. Given an opportunity to work towards harmonizing different interest for the world water uses, what will you do to avoid international conflicts? (5)
4. List five factors that contribute to unsustainable water resources development. (5)

QUESTION FIVE

1. A family has not more than E100.00 per month to spend on water bills. At present at present the family pays E70.00.
    a. Do you expect their reaction to a price increase of 10% to be elastic or rigid? Give reason(s) for your answer. (5)
    b. A few years later after a number of price increases, the amount of money the family is paying amount to E100.00 per month. If the price is again increased by 10% how do you expect their reaction with regards to water demand to be? Explain your answer. (5)
    c. Is evaporation a loss to the water resources of a country? Explain your answer. (2)

2. Given the following parameters.
    (a) ETo = 6.5 mm/d
    (b) Fc = 20
    (c) Wp = 10
    (d) D root = 80 mm
    (e) Kc = 8.2 mm/d
    (f) P = 0.65

Calculate the following

a. Maximum evapotranspiration (ETm) of a crop. (1)
b. Readily available moisture in the root zone (4)
c. Readily available moisture to a plant roots (3)

QUESTION SIX

Consider a ten (10) days period of a maize crop, at a beginning of which the irrigation system breaks down so that no irrigation water is available over the entire period of 10 days. At day one the soil moisture is at field capacity. The following data are also given.

Potential evaporation Et_m	10 mm /d
Effective rainfall P_{eff}	0 mm /d
Rooting depth D	0.8m

Available soil moisture S_a	100 mm /m
Soil moisture depletion fraction p	0.55
Yield response facture	1.25

1. Calculate, for the 10 days period, the day-to day available moisture, and actual evapotranspiration. (5)
2. Calculate the reduction due to the break down of the irrigation system. (5)
3. Calculate the actual evapotranspiration if there is 25mm of effective rainfall on each of the 6 and 7 day. (10)

20 marks