

UNIVERSITY OF SWAZILAND
Faculty of Health Sciences

DEGREE IN ENVIRONMENTAL HEALTH SCIENCES

FINAL EXAMINATION PAPER 2012

TITLE OF PAPER	:	WATER RESOURCES MANAGEMENT II
COURSE CODE	:	EHS 581
DURATION	:	2 HOURS
MARKS	:	100
INSTRUCTIONS	:	READ THE QUESTIONS & INSTRUCTIONS CAREFULLY
	:	ANSWER ALL QUESTIONS
	:	EACH QUESTION CARRIES 25 MARKS
	:	WRITE NEATLY & CLEARLY
	:	NO PAPER SHOULD BE BROUGHT INTO NOR OUT OF THE EXAMINATION ROOM
	:	BEGIN EACH QUESTION ON A SEPARATE SHEET OF PAPER

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

QUESTION ONE

1. What are the four key reasons for population projections in water resources management? (4)
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 of 3%.
 - a) What is the average life expectancy? (5)
 - b) What percentage of people dies each year? (5)
 - c) How many children are there per woman? (5)
 - d) How long will it take the population to double? (6)

QUESTION TWO

1. Mention four elements of water pricing that can be used in equity water allocation. (4)
2. 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)
3. With an aid of a diagram illustrate the relations between price and demand to show water project elasticity. (5)
4. Why some industrial and domestic water use are most of the time rigid to water price increase? (2)
5. Demonstrate by use of a diagram, how you will achieve cost recovery and equity in your water charging system for an urban area? (4)

QUESTION THREE

1. You are asked to decide on a dispute of water allocation, in a nutshell what will you consider in solving the problem? (5)
2. Why it is important for the water resources manager to have knowledge about agriculture water demand? Explain five reasons for a requirement (5)
3. 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 E_{tm}	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

- a) Calculate, for the 10 days period, the day-to day available moisture, and actual evapotranspiration. (10)
- b) Calculate the reduction due to the break down of the irrigation system. (5)

QUESTION FOUR

1. Mention two advantages of an increasing block rate as opposed to flat rate in water tariffs (5)
2. Mention five demand-oriented measures in water resources management. (5)
3. Write about water pricing as an important element and key instrument for the implementation of demand management in water resources management. (15)

QUESTION FIVE

1. What does equity mean in relation to water allocation? (5 marks)
2. Consider a rain fed maize crop, where precipitation is 700mm, of which 100mm is intercepted and evaporates, 100mm runs off into streams. Of the 500mm the remain 500mm that infiltrates into the soil, 100mm percolates to recharge ground water. The maize crop yield 400kg/ha. What is the water utilization efficiency of this rain fed crop? (5 marks)
3. Given that an alluvial, medium textured granite soil with coarse sand fraction, has the following parameters: moisture content (vol%) FC 20% and WP 10%. The maize crop is planned; with rooting depth of 0.80m; and the soil water depletion fraction $p = 0.60$. What is the readily available moisture for the maize on this soil? (5 marks)
4. Given irrigated maize, with no effective rainfall, during peak period, $E_{to} = 6.2\text{mm/d}$, $K_c = 1.2$ effective rooting depth = 1.0m $e_f = 0.7$ FC = 30% WP 16% $p = 0.65$; farm size is 1ha. Calculate appropriate irrigation interval during peak period. (10 marks)