



UNIVERSITY OF SWAZILAND
Faculty of Health Sciences

DEGREE IN ENVIRONMENTAL HEALTH

FINAL EXAMINATION PAPER 2009

TITLE OF PAPER	:	WATER RESOURCES MANAGEMENT II
COURSE CODE	:	EHS 581
DURATION	:	2 HOURS
MARKS	:	100
INSTRUCTIONS	:	READ THE QUESTIONS & INSTRUCTIONS CAREFULLY
	:	ANSWER ANY FOUR 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

- a) It is said that demand management consists of five P's: state what does these P's stand for.? (5 marks)
- b) Why do water managers have to charge consumers for water use, yet this is a natural resources? (5 marks)
- c) What does the following terms means in water resources and how can these be used in creating incentive for water demand management?
- a. Subsidies
 - b. Grants or soft loans
 - c. Tax allowances and tax exemptions
 - d. Market creation
 - e. Fines
 - f. Performance bonds (15 marks)

Question two

The water price is composed of many different elements that reflect production of the commodity. Mention these elements and describe how they influence water resources management? (25 Marks)

Question three

- a) What are the four key reasons for population projections (total and a real distribution) in water resources management? (10 Marks)

- b) A city has the following population in 2000 and 2005

Year	City population
2000	10 000
2005	12 000

It has been established that the population grew exponentially during this period.

- a) What is the average annual growth rate of the population of this city during the period under consideration? (5 marks)
- b) Make a population projection in 2010 if the growth rate is the same.(10 marks)

Question four

- a) What does equity mean in relation to water allocation? (5 marks)
- b) 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)

- c) 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)
- d) 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)

Question five

- a) With the aid of a diagram illustrate the relations between price and demand to show water project elasticity. (10 marks)
- b) Why some industrial water users and domestic are most of the time rigid to water price increase? (5 marks)
- c) Demonstrate by use of a diagram, how you will achieve cost recovery and equity in your water charging system for an urban area? (10 marks)