

**UNIVERSITY OF SWAZILAND  
DEPARTMENT OF GEOGRAPHY, ENVIRONMENTAL SCIENCE AND  
PLANNING**

**MAIN EXAMINATION:                   DECEMBER, 2009  
  B.Sc. II**

**TITLE OF PAPER                   :     WATER RESOURCES**

**COURSE NUMBER                 :     GEP 228**

**TIME ALLOWED                 :     THREE (3) HOURS**

**INSTRUCTIONS                 :     SECTION A IS COMPULSORY  
  ANSWER ANY TWO QUESTIONS FROM  
  SECTION B  
  ILLUSTRATE YOUR ANSWERS WITH  
  APPROPRIATE DIAGRAMS**

**MARKS ALLOCATED             :     QUESTION 1 CARRIES 40 MARKS THE  
  OTHER QUESTIONS CARRY 30 MARKS  
  EACH**

**THIS PAPER IS NOT TO BE OPENED UNTIL PERMISSION HAS BEEN GRANTED  
BY THE INVIGILATOR**

## SECTION A: COMPULSORY QUESTION

### Question 1:

- (a) Define infiltration and explain the factors that affect it. (10 marks)
  - (b) Discuss how infiltration affects the runoff of a catchment. (10 marks)
  - (c) Table 1 presents the One-day Unit hydrograph ordinates. Calculate the surface runoff resulting from an effective rainfall storm of 16 mm for a duration of one day. (20 marks)
- (40 marks)**

Table 1. One-day Unit hydrograph ordinates

Time (days)	One-day Unit Hyd. Ordinates ( $\text{m}^3/\text{s}$ )
1	0.00
2	1.8
3	6.0
3.5	6.33
4	5.53
5	3.51
6	2.36
7	1.57
8	1.02
9	0.53
9.5	0.00

## SECTION B: ANSWER ANY TWO QUESTIONS

### Question 2

- (a) Two catchments of the same size received precipitation of the same characteristics (intensity, duration, etc.). One of the catchments has been urbanized while the other is still in the natural state (mixed forest and grassland). Which of the two catchments produced the highest peak discharge and why? (15 marks)
  - (b) Explain two methods of measuring discharge giving the suitability of each. (15 marks)
- (30 marks)**

### Question 3

- (a) Discuss the factors affecting the amount of solar energy received by the Earth. (15 marks)
  - (b) Explain the mechanisms of solar energy transport between the atmosphere and the earth. (15 marks)
- (30 marks)**

**Question 4**

Discuss how climate affects the agricultural activities in Swaziland. **(30 marks)**

**Question 5**

(a) Explain the importance of river discharge measurement. **(10 marks)**

(b) Discuss the approaches used to estimate the available water resource in a given catchment. **(20 marks)**

**(30 marks)**