

**UNIVERSITY OF SWAZILAND**  
**Faculty of Health Sciences**  
**Department of Environmental Health Sciences**

**BSc Environmental Health**

**MAIN EXAMINATION PAPER DECEMBER 2011**

**TITLE OF PAPER** : HYDROLOGY

**COURSE CODE** : EHS:545

**DURATION** : 2 HOURS

**MARKS** : 100

**INSTRUCTIONS** : THERE ARE FIVE QUESTIONS IN THIS EXAM  
: ANSWER ANY FOUR OF THE FIVE QUESTIONS  
: EACH QUESTION CARRIES 25 MARKS  
: NO PAPER SHOULD BE BROUGHT INTO OR OUT OF THE  
EXAMINATION ROOM

EHS 545  
DECEMBER 2011

**QUESTION ONE (25 Marks)**

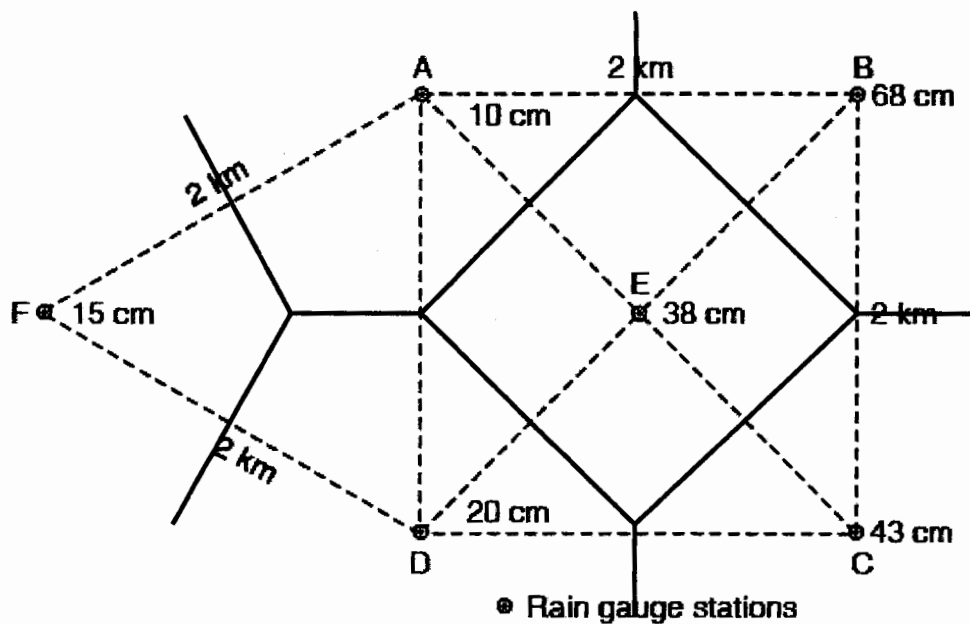
The following were the monthly evaporation data in cm in a certain year in the vicinity of a lake.

Month	JAN	FEB	MAR	APR	MAY	JUN
Evaporation (cm)	15.7	14.1	16.9	24	27.5	21.4
Month	JUL	AUG	SEP	OCT	NOV	DEC
Evaporation (cm)	15.7	16.2	16.2	20.5	15.7	15.4

The water spread area in the lake in the beginning of January was  $3.2\text{km}^2$  and at the end of December  $2.6\text{km}^2$ . Calculate the loss of water in millions  $\text{m}^3$  due to evaporation in that year. Assume a pan coefficient of 0.7.

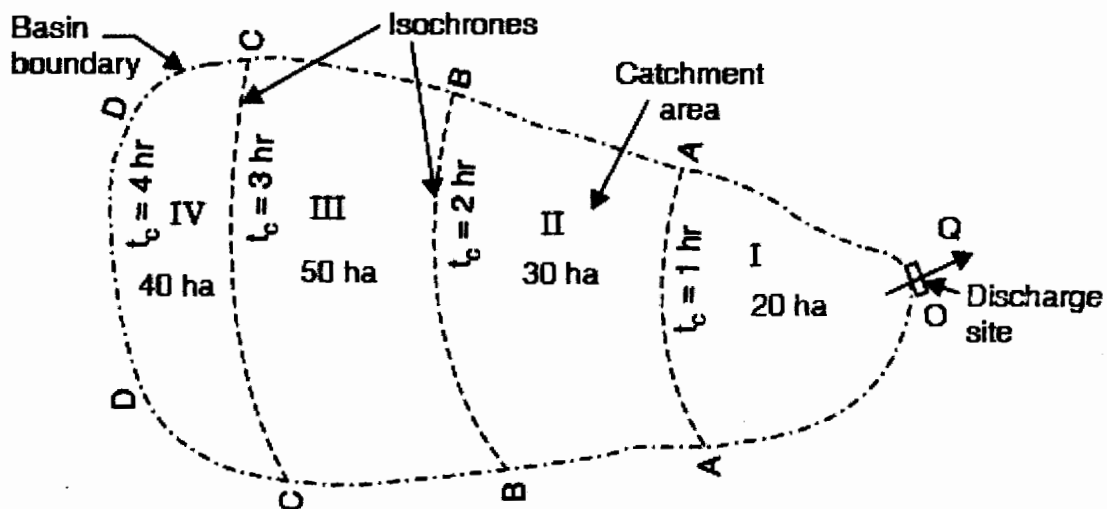
**QUESTION TWO (25 Marks)**

Find the mean precipitation for the area shown in the figure below by Thiessen polygon method. The area is composed of a square plus an equilateral triangular plot of side 2km. Rainfall readings are in cm at the various stations indicated.



### QUESTION THREE (25 Marks)

A 4- hour rain of average intensity 2cm/hr falls over the catchment shown in the figure below. The time of concentrations from the lines AA, BB, CC and DD are 1,2,3 and 4 hours, respectively, to the site O where the discharge measurements are made. The values of the runoff coefficients  $C$  are 0.5, 0.6, for the 1<sup>st</sup> and 2<sup>nd</sup> hours respectively and 0.7 and 0.8 for the 3<sup>rd</sup> and 4<sup>th</sup> hours respectively. After 4 hours the  $c$  value attains a constant value of 0.8. Determine the discharge at site O.



### QUESTION FOUR (25 Marks)

State whether each of the following statements is True or False. (each question carries 2.5 marks)

- 4A. Hydrological cycle has a beginning but does not end.
- 4B. Orographic precipitation is due to the lifting of moist air converging on to low pressure belt.

- 4C. Less number of rainfall stations are required in hilly and very heavy rainfall areas than that required by plains.
- 4D. A double mass curve is used to detect if there had been a change in the trend of rainfall at a certain station compared to neighboring stations.
- 4E. A moving average curve is desirable when the variation between rainfalls of consecutive years is not wide.
- 4F. The rate of evaporation increases when the relative humidity increases.
- 4G. A pan evaporation measurement besides a lake is less than the actual evaporation from a lake
- 4H. Evapotranspiration can be affected by moisture level in the soil.
- 4I. Isohytes represent lines of precipitation occurring at equal times.
- 4J. Vesicular basalts can serve as good aquifers.

**QUESTION FIVE (25 Marks)**

Find the hydraulic conductivity in  $m^2/day$  of an artesian aquifer being pumped by a fully penetrating well. The aquifer is 30 meters thick and composed of medium sand. The steady state pumping rate is 4000 liter per minute. The drawdown at an observation well 15 meters away is 3 meters. In a second observation well 150 meters away it is 0.3 meters.