

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

BSc Environmental Health

MAIN EXAMINATION PAPER DECEMBER 2015

TITLE OF PAPER : HYDROLOGY

COURSE CODE : EHM318

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

EHM 318
DECEMBER 2015

QUESTION ONE (25 Marks) (Each question carries 5 marks.)

- 1A.** Explain the difference between dry adiabatic lapse rate and wet adiabatic lapse rate.

- 1B.** Differentiate between infiltration and percolation.

- 1C.** Describe the positive and negative effects of the atmospheric greenhouse effect and list the potential greenhouse gases that may be present in the atmosphere.

- 1D.** Describe how the drainage density and shape of catchment influence runoff characteristics.

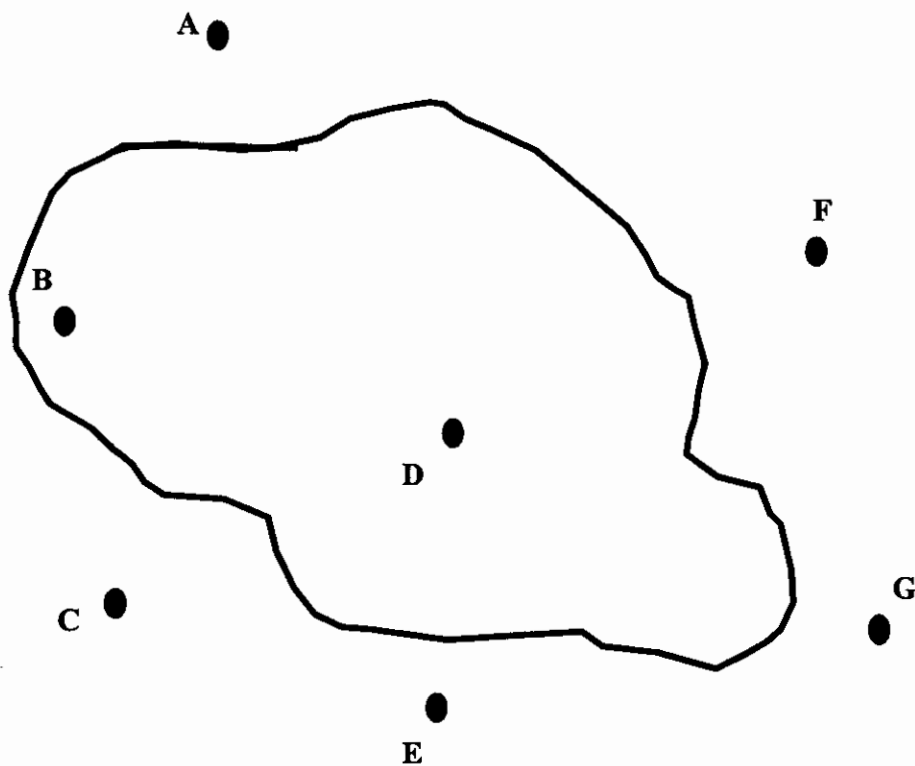
- 1E.** Explain how the runoff coefficient may vary with time after the beginning of rain.

QUESTION TWO (25 Marks)

For the catchment area and precipitation measuring station shown in the figure below,

- 2A. Draw the Thiessen polygon[15 marks]

- 2B. Indicate the area that each precipitation measuring station represents. ...[10 marks]



QUESTION 3 (25 Marks)

A river catchment has 2 hour duration unit hydrograph with ordinates shown in the table below. Assume that the base flow at time $t = 0$ hour is $20 \text{ m}^3/\text{sec}$ and linearly increases to $44 \text{ m}^3/\text{sec}$ at $t = 24$ hours at a uniform rate

3A. Compute the hydrograph resulting from two successive 2 hour periods of effective rain of 2.0 cm and 1.5 cm respectively.[15 marks]

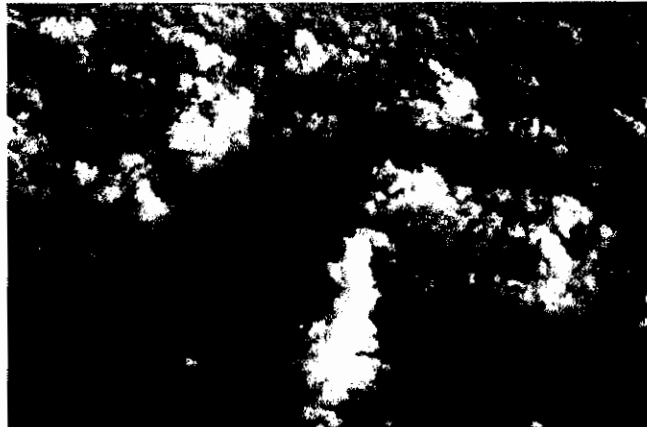
3B. To prevent downstream flooding, the maximum flow to be released from the catchment is set at $180 \text{ m}^3/\text{sec}$. Calculate the volume space needed to store the excess water from this event (in m^3).[10 marks]

Time (hr)	0	2	4	6	8	10	12	14	16
UH (m^3/sec)	0	3	11	35	55	66	63	40	22
Time (hr)	18	20	22	24					
UH (m^3/sec)	9	2	0	0					

QUESTION FOUR (25 Marks) (Each question carries 5 marks.)

4A. Describe the factors that make the southern hemisphere winter “hotter” and the summer “colder” than the northern hemisphere.

4B. Characterize the cumulus cloud shown below and state what each portion in the picture represents.



4C. Describe with the help of a diagram the process of formation of lenticular clouds.

4D. List the factors that are important in the formation of rain by the collision-coalescence process.

4E. Describe the role of the differential saturation vapour pressure above water and ice in the formation of rain by the ice-crystal (Bergeron) process.

QUESTION FIVE (25 Marks)

A well 0.5 m in diameter penetrates 33 below the static water table. After a long period of pumping at a rate of $80 \text{ m}^3/\text{hr}$, the drawdown in wells 18 and 45 m from the pumped well were found to be 1.8 and 1.1 m respectively.

- 5A.** What is the transmissivity of the aquifer? [9 marks]
- 5B.** What is the approximate drawdown in the pumped well? [8 marks]
- 5C.** Determine the radius of influence of the pumping well? [8 marks]