



TECHNICAL UNIVERSITY OF MOMBASA  
**Faculty of Engineering &  
Technology**

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

UNIVERSITY EXAMINATION FOR:  
**BACHELOR OF SCIENCE IN CIVIL ENGINEERING**

ECE 2410: HYDROLOGY II

**END OF SEMESTER EXAMINATION**

SERIES: DECEMBER 2013

**TIME ALLOWED: 2 HOURS**

**Instructions to Candidates:**

You should have the following for this examination

- *Answer Booklet*

This paper consists of **FIVE** questions. Answer question **ONE (Compulsory)** and any **TWO** questions

Maximum marks for each part of a question are as shown

This paper consists of **TWO** printed pages

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**Question One (Compulsory)**

- Using illustrations, explain what a hydrograph is and highlight its main components. **(12 marks)**
- Briefly discuss the unit hydrograph concept and highlight the assumptions considered. **(8 marks)**

c) Outline FOUR activities that could influence base flow **(8 marks)**

d) Define “Flow Routing” **(2 marks)**

**Question Two**

a) Outline the factors that affect the shape of a flood hydrograph **(10 marks)**

b) For a rectangular basin with a single channel centrally located and flowing along the longer side of the basin, (Length = 15km, width = 10km). Define and compute:  
 (i) Form factor  
 (ii) Circularity ratio  
 (iii) Elongation ratio **(10 marks)**

**Question Three**

a) The ordinates of 1-hr UH from a water shed are given in the table below. Using S-curve approach, derive a 2 hr UH and as well as estimate the area of the water shed. (UH = Unit Hydrograph) **(10 marks)**

Time h	0	1	2	3	4	5	6	7
UH(m <sup>3</sup> /s.cm)	0	1.0	15	40	20	7.5	2.5	1

b) Outline factors initiating and modifying floods and highlight measures for reducing flood damage. **(10 marks)**

**Question Four**

a) (i) Define “Return Period” **(5 marks)**

(ii) What is the probability that a T-year return period event will occur at least once in N-years? **(5 marks)**

b) Explain the relationship between channel geometry and flow characteristics **(10 marks)**

**Question Five**

a) Briefly describe the concept of reservoir routing **(8 marks)**

b) A reservoir for detaining flood flows is 4.356ha in horizontal area, has vertical sides and has 5m diameter reinforced concrete pipe as the outlet structure. The headwater – discharge relation for the outlet pipe is given in the table 1 below. Use level pool routing method to calculate the reservoir outflow from the inflow hydrograph given in table 2. Then plot storage out-flow function. **(12 marks)**

**Table 1**

Elevation (m)	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0
Discharge (m <sup>3</sup> /s)	0	3	8	17	30	43	60	78	97	117	137	15	17	19	20	21	231

**Cont'd.**

Elevation (m)	8.5	9	9.5	10.0
Discharge (m <sup>3</sup> /s)	242	253	264	275

**Table 2**

Time (min)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150
Inflow (m <sup>3</sup> /sec)	0	3	8	17	30	43	60	78	97	117	137	156	173	190	205	218