TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

UNIVERSITY EXAMINATION FOR:

BSC IN CIVIL ENGINEERING

ECE 2410 : HYDROLOGY II

END OF SEMESTER EXAMINATION

SERIES:APRIL2016

TIME:2HOURS

DATE:10May2016

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, Drawing Instruments, Scientific calculator, examination pass and student ID

This paper consists of five questions.

Attemptquestion ONE (Compulsory) and any other TWO questions.

Question ONE (Compulsory)

a). Define the following terms as used in hydrology:

i). Stream flow hydrograph

ii). Rainfall Excess

iii). Retention

iv). Overland flow (8 Marks).

b). Determine the direct runoff, Φ - index and the excess rainfall hyetograph from the observed rainfall and the streamflow data given in Table 1. The area of the watershed is 7.03 mi^2

(16 Marks).

Time	Observed		Direct runoff	Excess Rainfall (in)
	Rain (in)	**Flow (cfs)**	**(cfs)**	**(cfs)**
8.30	0.15	205		
9.00	0.26	248		
9.30	1.35	290		
10.00	2.40	900		
10.30	2.11	2524		
11.00	0.3	5700		
11.30	0.010	9600		
12.00		12000		
12.30		8300		
1.00		4400		
1.30		2300		
2.00		1809		
2.30		1240		
3.00		713		
3.30		395		
4.00		360		
4.30		300		

c). Discuss the procedures for developing an empirical flood frequency curve (6 Marks).

Question TWO

a). Define Unit Hydrograph. Briefly discuss the assumptions made during its derivation (10 Marks).

b). What is Peak Discharge? Outline the key watershed factors affecting peak discharge in a catchment (10 Marks).

Question THREE

Given the below table, calculate the **Direct Runoff** from the Unit Hydrograph (**12 Marks).**

Time	UH_3	0.5 UH_3	1.5 UH_3	3- hrs lagged 1.5UH_3	6- hrs lagged 1.5UH_3	DRH
(hrs)	(cfs/in)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
0	0					
1	40					
2	100					
3	140					
4	180					
5	200					
6	195					
7	150					
8	135					
9	110					
10	80					
11	50					
12	24					
13	0					
14	0					
15	0					
16	0					
17	0					
18	0					

b). Briefly discuss three factors that influence the hydrologic systems **(4 Marks).**

Question FOUR

The following data is for an annual maximum discharge of a river for 45 years.

Year	Data	Year	Data	Year	Data	Year	Data
1950	804	1961	507	1972	1651	1983	1254

1951	1090	1962	1303	1973	716	1984	430
1952	1580	1963	197	1974	286	1985	260
1953	487	1964	583	1975	671	1986	276
1954	719	1965	377	1976	3026	1987	1657
1955	140	1966	348	1977	306	1988	937
1956	1583	1967	804	1978	116	1989	714
1957	1642	1968	328	1979	162	1990	855
1958	1586	1969	245	1980	425	1991	399
1959	218	1970	140	1981	1982	1992	1543
1960	623	1971	49	1982	277	1993	360
						1994	348

Determine the following:

a). values of parameters $\propto and\ \beta$ (4 Marks).

b). P(X$\geq x_m$) and T (return period) (16 Marks).

Question FIVE

a). Define flood routing (2 Marks).

b). Describe steps followed in determining Muskingum routing for K and X (6 Marks).

c). The following inflow and outflow hydrographs were observed in a river reach. Estimate the values of K and x applicable to this reach in the Muskingum equation.

Time	**0**	**6**	**12**	**18**	**24**	**30**	**36**	**42**	**48**	**54**	**60**	**66**
Inflow	**5**	**20**	**50**	**50**	**32**	**22**	**15**	**10**	**7**	**5**	**5**	**5**
Outflow :	**5**	**6**	**12**	**29**	**38**	**35**	**29**	**23**	**17**	**13**	**9**	**7**