



WI-3-44-1-6

JOMO KENYATTA UNIVERSITY

OF

AGRICULTURE AND TECHNOLOGY

UNIVERSITY EXAMINATIONS 2016/2017

**YEAR 2 SEMESTER II EXAMINATION FOR THE DEGREE OF BACHELOR OF
SCIENCE IN LAND RESOURCES PLANNING AND MANAGEMENT**

ALP 2203: PRINCIPLES OF HYDROLOGY

DATE: June 2017

TIME: 2 HOURS

INSTRUCTIONS: ANSWER QUESTION ONE AND ANY OTHER TWO QUESTIONS.

QUESTION ONE

- a) i. Explain briefly the hydrological cycle (7marks)
- ii. What are the drainage basins of Kenya? (3marks)
- iii. Explain briefly the characteristics of a watershed. (5marks)
- b) i. Explain the factors which affect evaporation. (6marks)
- ii. Describe the USA class A pan for measurement of evaporation and explain how it is used to measure evaporation. (4marks)
- c) i. Define the unit hydrograph (1mark)
- ii. Explain briefly the components of the hydrograph (1mark)

QUESTION TWO

The following data was collected during stream-gauging operation in a river. Compute discharge using the mean and mid-section methods. (20marks)

Depth from edge (m)	Depth (d) m	Velocity (m ³ /s)	
		At 0.2d	At 0.8d
0	0	0	0
1.5	1.3	0.6	0.4
3.0	2.5	0.9	0.6

4.5	1.7	0.7	0.5
6.0	1.0	0.4	0.4
7.5	0.4	0	0.3
9.0	0		0

QUESTION THREE

- a) i. Explain the process of formation of precipitation (3marks)
- ii. A drainage basin of 600 km^2 , isohyets drawn for a given storm gave the following data
- | | | | | | |
|--------------------------------------|-------|------|-----|-----|-----|
| Isohyet interval | 15-12 | 12-9 | 9-6 | 6-3 | 3-1 |
| Inter-isohyet area (Km^2) | 92 | 128 | 120 | 175 | 85 |
- Estimate the average depth of rainfall over the basin. (5marks)
- iii. A rectangular watershed of size 14 km by 14 km has four rain gauges with the following rainfall records;
- | | |
|----------|---------------|
| Location | Rainfall (mm) |
| (0,4) | 59 |
| (10,4) | 79 |
| (10,12) | 94 |
| (0,12) | 169 |
- Estimate the area rainfall using the Thiessen polygon method (6marks)
- b) Discuss the methods used in hydrograph separation (6marks)

QUESTION FOUR

- a) Derive an S-Hydrograph using the 4-hour unit hydrograph given
- | | |
|----------|--------------------------------|
| Time (h) | UH ($\text{m}^3/\text{s-m}$) |
| 0 | 0 |
| 4 | 180 |
| 8 | 560 |
| 12 | 540 |
| 16 | 260 |
| 20 | 120 |
| 24 | 35 |
| 28 | 8 |
| 32 | 0 |
- Derive a 2-hour unit hydrograph. (10marks)
- b) The following peak discharges represent the annual maximum flows for the Nile River for the year 1961 to 1970

Year	Flow
1961	4510
1962	7060
1963	4550
1964	3500
1965	3420
1966	3880
1967	2740
1968	3650
1969	4350
1970	2660

Based on this record, determine the 2-, 5-, 10-, 50-, and 100- year discharge assuming extreme value type I distribution (10marks)