JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF SPATIAL PLANNING

UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE

WATER RESOURCE AND MANAGEMENT

SEMESTER 2016/2017 ACADEMIC YEAR

CENTRE: MAIN CAMPUS

COURSE CODE: PWE 3313

COURSE TITLE: SURFACE HYDROLOGY

EXAM VENUE: **STREAM: SPATIAL PLANNING**

DATE: **EXAM SESSION:**

TIME: 2 HOURS

Instructions:

1. **Answer question 1 (compulsory) and ANY other 2 questions.**
2. **Candidates are advised not to write on the question paper.**
3. **Candidates must hand in their answer booklets to the invigilator while in the examination room.**

QUESTION ONE [30 marks]

a) Discuss the importance of field hydrology in Kenya **[5 marks]**

b) Discuss the influence of humans on the hydrological cycle. **[7marks]**

c) Describe the three methods of determining the average depth of rainfall over an area. Bring out the merits and demerits of each method. **[11 marks]**

d) The total observed runoff volume during a 6 hour storm with uniform intensity of 1.5 centimetres per hour is $21.6 \times 10^6 m^3$. If the area of the basin is $300\ km^2$, find the average infiltration rate for the basin. **[7 marks]**

QUESTION TWO [20 marks]

(a) Discuss the components of stream flow. **[5 marks]**

(b) What points would you keep in mind while selecting a suitable site for the discharge observation of a river? **[5 marks]**

(c) The data given in Table 2(c) is obtained during the gauging of a stream.

Table 2(c)

Distance from left water edge [m]	Depth d in metres	Velocity m/s at 0.2d	Velocity m/s at 0.8d
0	0.00	0.00	0.00
1	1.25	0.50	0.30
2	2.00	0.75	0.50
3	3.00	1.00	0.60
4	2.50	0.85	0.50
5	2.00	0.80	0.50
6	1.50	0.70	0.40
7	0.00	0.00	0.00

Compute the discharge in the stream. **[6 marks]**

(d) Describe with sketches how the flow in a river can be measured with the help of a vertical staff gauge. **[4 marks]**

QUESTION THREE [20 marks]

(a) Define Ø-index and W-index and bring out the differences between them. How is Ø-index determined from the rainfall hyetograph? **[7 marks]**

(b) A storm of 24 hours duration occurring in a catchment produces the following isohyets in table 3(b):

Table 3(b)

Isohyets [cm]	Enclosed area [km^2]	Isohyets [cm]	Enclosed area [km^2]
17	34.5	7	292.5
15	75.0	5	375.0
13	120.0	3	450.0
11	172.5	1	532.5
9	225.0		

Compute the depth area duration (DAD) curve of this 24 hours storm. **[9 marks]**

(c) Describe precipitation characteristics that affect the runoff from a catchment area. **[4 marks]**

QUESTION FOUR [20 marks]

(a) Discuss physiographic and climatic factors affecting flood hydrograph. **[7 marks]**

(b) A water shed has the following data:

- Area of water shed = 82 square kilometres
- Distance between the outlet and further most point = 12.6 kilometres
- Total length of channels of various orders = 440 meters
- Elevation difference between outlet and further most point = 656 metres.

Determine:

i. Drainage density **[2 marks]**

ii. Form factor **[2 marks]**

iii. Channel slope **[2 marks]**

iv. Average over land flow length **[2 marks]**

(c) Discuss factors that influence the rate of evaporation. **[5 marks]**

QUESTION FIVE **[20 marks]**

(a) Discuss the causes and effects of floods. **[10 marks]**

(b) Describe the principle involved in the measurement of stream flow by the dilution method. What are the requisites of a good tracer used in the dilution method? **[4 marks]**

(c) A drainage basin has an area of 210 kilometres squared. The average depth of rainfall received by it is 65 cm, while the runoff measured at its outlet during the same period is $5.68 \times 10^7 \text{ m}^3$.

i. Compute the depth of runoff. **[2 marks]**

ii. What percentage of rainfall has become runoff? **[1 mark]**

iii. If this runoff volume is stored and used to irrigate a crop which requires 60 cm of water, how many hectares can be irrigated? **[3 marks]**