MURANG'A UNIVERSITY OF TECHNOLOGY

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

UNIVERSITY ORDINARY EXAMINATION

2024/2025 ACADEMIC YEAR

FOURTH YEAR **FIRST** SEMESTER EXAMINATION FOR BACHELOR OF TECHNOLOGY IN EDUCATION (CIVIL ENGINEERING)

EBT 404 – WATER RESOURCES ENGINEERING

DURATION: 2 HOURS

INSTRUCTIONS TO CANDIDATES:

1. Answer question ONE and any other two questions.
2. Mobile phones are not allowed in the examination room.
3. You are not allowed to write on this examination question paper.

SECTION A – ANSWER ALL QUESTIONS IN THIS SECTION

QUESTION ONE (30 MARKS)

(a) Define the following terms;

i. Flood return period (1 mark)

ii. Design storm (1 mark)

iii. Reservoir routing (1 mark)

iv. Unit hydrograph (1 mark)

(b) Using a well labelled diagram, define the hydrological cycle. (8 mark)

(c) Table Q1(c)) shows the ordinates of a 2hr-unit hydrograph. Find the ordinates of flood hydrograph if the depth of rainfall excess is 10cm, consider a constant base flow of $10m^3/s$.

Table Q1(C) (6 marks)

Time(HR)	2	4	6	8	10	12	14
Ordinates of 2HR Ur(m^3/s)	0	10	20	30	20	10	0

(d) Outline any four pillars of integral water resource management. (8 marks)

(e) Discuss any four (4) resources of water. (4 marks)

SECTION B – ANSWER ANY TWO QUESTIONS IN THIS SECTION

QUESTION TWO (20 MARKS)

(a) State any three (3) limitations of the unit hydrograph theory. (3 marks)

(b) The thunderstorm of six hours durations with the excess rainfall of 154mm produces the following surface runoff hydrograph.

Date and Time(HRS)		**Surface runoff(m^3/s)**
June 15	0600	10
	1200	500
	1800	1600
	M.N	3500
June 16	0600	5200
	1200	3100
	1800	1500
	M.N	650
June 17	0600	250
	1200	0
	1800	0
	M.N	0

Find the ordinates of 6 hours' unit hydrograph having a unit volume equal to 1000mm.

(17 marks)

QUESTION THREE (20 MARKS)

(a) Outline any four (4) sources of ground water (4 marks)

(b) An urban catchment in Murang'a County has an area of 85ha. The slope of the catchment is 0.006 and the maximum length of travel of water is 950m. The maximum depth of rainfall with a 25-year return period is shown below.

Duration in mm	5	10	20	30	40	60
Max.depth of rainfall(mm)	7	26	40	50	57	62

If a culvert for drainage of the outlet of this area is to be designed for a return period of 25years, estimate the required peak- flow rate, by assuming the run-off coefficient of 0.3. (5 marks)

(c) Outline any three (3) principles of subsoil management (3 marks)

(d) Discuss any EIGHT (8) challenges of integrated water resources management. (8 Marks)

QUESTION FOUR (20 MARKS)

(a) Discuss any six (6) methods of evaluating precipitation losses. (12 marks)

(b) List four (4) methods of direct determination of stream flow (4 marks)

(c) Outline the mechanics of water erosion. (2 marks)

(d) Define the term groin and outline any advantage of its use in river erosion control. (2 marks)