



KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2011/2012

SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR
OF SCIENCE (CIVIL ENGINEERING)

ECV 303: PUBLIC HEALTH ENGINEERING I

DATE: Wednesday, 18th April, 2012

TIME: 8.00 a.m. – 10.00 a.m.

INSTRUCTIONS

This question paper contains 5 questions. Answer Question One & Any Other Two Questions

QUESTION ONE

- a) Outline six factors that must be considered when selecting a source of drinking water.

(6 marks)

- b) With the aid of a sketch describe a typical tower water intake for an impounding reservoir.

(6 marks)

- c) Design a rectangular sedimentation tank using the following information:

Population	-	30,000
Average per capita water demand	-	150 litres/day
Detention period	-	4 hours
Velocity of flow	-	0.1 m/min
Depth of water in tank	-	3.0 m
Sludge depth	-	0.75 m
Free board	-	0.5 m

(12 marks)

- d) Outline six characteristics of a good disinfectant.

(6 marks)

QUESTION TWO

- a) With the aid of a sketch describe a piled intake structure and state where it is best utilized.

(4 marks)

- b) With the aid of a sketch describe water intakes from infiltration wells

(6marks)

- c) Design a bell mouth canal for a city of 100,000 persons drawing water from a canal which runs for 8 hours a day with a depth of 2.1 m. Assume the following data:

- Per capita consumption per person as 150 litres per day.
- The velocity through the screens as 0.18m/s
- The velocity through the bell mouth as 0.35 m/s.
- The area occupied by solid bars as 25 per cent of the total area
- The minimum water level at 0.35 m below the normal water level
- The screen placed at 0.25 m above canal level.

(10 marks)

QUESTION THREE

- a) State five factors that affect the amount of coagulants and describe a test for determining the optimum coagulant dose.

(11 marks)

- b) Explain the role of coagulant aids in water treatment process and name two coagulant aids.

(4 marks)

- c) The filter is 5.5 m by 11.0 m. After filtering 12,000m³/d in 24 hour period, the filter is backwashed at a rate of 13 litres per second for 15 minutes. Compute

- i. The average filtration rate
- ii. The quantity of wash water
- iii. The percentage of treated water used in backwashing

(6 marks)

QUESTION FOUR

- a) Discuss breakpoint chlorination.

(6 marks)

- b) Determine the quantity of bleaching powder required per year for the water works of a town given the following information:

i. Population = 25,000 persons

ii. Per capita water demand = 200litres/day

iii. Disinfection is by bleaching powder having 45% available chlorine

iv. Chlorine dose at the water works required for disinfection = 0.3 mg/l.

(5 marks)

c) Discuss disinfection of water using ozone and state five advantages of ozonation.

(9 marks)

QUESTION FIVE

a) State five objectives to be achieved through purification of water

(5 marks)

b) Discuss the causes of the following parameters in raw water

i. Turbidity

ii. Taste and odour

iii. Colour

(6 marks)

c) Working from the first principles, derive Stokes law for settlement for discrete particles in water

(7 marks)

d) Compare the rapid and slow sand filter under the following characteristics

i. Rate of filtration

ii. Effective size of sand

(2 marks)

