TECHNICAL UNIVERSITY OF MOMBASA
DEPARTMENT OF BUILDING AND CIVIL ENGINEERING
BACHELOR OF SCIENCE IN CIVIL ENGINEERING
YEAR III SEMESTER I

ECE 2503 Water Resources Engineering I **DATE: April 2016**

INSTRUCTIONS:

(a) This paper contains FIVE (5) questions.
(b) Question ONE is compulsory.
(c) Attempt any other TWO questions.
(d) Question ONE carries 30 marks and the others carry 20 marks each

QUESTION ONE [30 Marks]

a) Discuss global overview of water resources.

[7marks]

b) Discuss the competing water uses in:
   i. The world.
   ii. High income countries.
   iii. Low and middle income countries.

[6 marks]

c) Explain the following curves in respect to reservoir capacity planning:
   i. Area elevation curve.
   ii. Elevation capacity curve.
   iii. Combined diagram of elevation area and elevation storage curves.

[9 marks]

d) The areas within the contour line at the site of a reservoir and the face of the proposed dam are as follows:

Contour (m)	Area (m^2)	Contour (m)	Area (m^2)
101	1,000	106	1,350,000
102	12,800	107	1,985,000
103	95,200	108	2,286,000
104	147,600	109	2,512,000
105	872,500	110	2,650,500

Taking 101 m as the bottom level of the reservoir and 110 m as the top level, compute the capacity of the reservoir by:

i. Trapezoidal formula
ii. Prismoidal formula

[6 marks]

QUESTION TWO [20 marks]

a) With the aid of a sketch explain the following:

i. Confined aquifer
ii. Unconfined aquifer

[4 marks]

b) With the aid of a sketch describe zone of aeration and zone of saturation of subsurface water

[4 marks]

c) A 60 cm diameter well is being pumped at a rate of 1360 litres per minute. Measurements in a nearby test well were made at the same time as flows:

At a distance of 6 m from the well being pumped, drawdown was 6 m, and at 15 m the drawdown was 1.5 m. the bottom of the well is 90 m below the ground water table. Determine the:

i. Coefficient of permeability.
ii. Transmissibility of the aquifer.
iii. Drawdown in the well during pumping.

[12 marks]

QUESTION THREE [20 marks]

a) Explain the following reservoir planning investigations:

i. Engineering surveys.
ii. Geological investigations.
iii. Hydrologic investigations.

[8 marks]

b) Discuss the factors which are considered for the selection of a site for a proposed reservoir.

[6 marks]

c) The yield of water from a catchment area during each successive month is (1.4, 2.1, 2.8, 8.4, 11.9, 7.7, 2.8, 2.52, 2.24, 1.96, 1.68) x 10^6 m^3. Determine the minimum capacity of a reservoir required to allow the above volume of water to be dawn off at a uniform rate assuming that there is no loss of water over the spillway by mass curve method.

[6 marks]

QUESTION FOUR [20 marks]

a) Briefly differentiate between rill erosion and gulley erosion.

[2 marks]

b) Discuss the adverse effects of sedimentation of reservoir.

[7 marks]

c) Discuss various methods of reservoir sedimentation control.

[6 marks]

d) Turbo village has a drainage basin area of $30{,}000\mathrm{m}^3$. It experiences an estimated suspended discharge of 54,000 kg/year and bed load discharge of 28,800 kg/year.

Assuming:

- The estimated bed load density = of $2{,}400\mathrm{kg/m}^3$.
- The estimated soil density = $600\mathrm{kg/m}^3$.

Calculate

i. The erosion rate and unit erosion rate
ii. Bed load lowering rate
iii. Soil lowering rate

[5 marks]

QUESTION FIVE [20 marks]

a) Discuss the factors which are considered for the selection of a site for a proposed dam.

[7 marks]

b) Discuss the factors governing the selection of the type of dam.

[6 marks]

c) Discuss factors taken into consideration when locating a suitable site for a spillway for an earth dam.

[2 marks]

d) Describe advantages and disadvantages of concrete or masonry dams.

[5 marks]