



(University of Choice)

MASINDE MULIRO UNIVERSITY OF  
SCIENCE AND TECHNOLOGY  
(MMUST)

MAIN CAMPUS

UNIVERSITY EXAMINATIONS  
2019/2020 ACADEMIC YEAR

FIFTH YEAR FIRST SEMESTER EXAMINATIONS

FOR THE DEGREE  
OF  
BACHELOR OF SCIENCE IN CIVIL AND STRUCTURAL ENGINEERING

COURSE CODE: CSE 551

COURSE TITLE: WATER RESOURCES ENGINEERING

**DATE: FRIDAY 24<sup>TH</sup> JANUARY 2020 TIME: 12.00 – 2.00 PM**

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**INSTRUCTIONS:**

1. This paper contains FOUR questions
2. Answer question ONE (compulsory) and any other TWO question
3. Marks for each question are indicated in the parenthesis.
4. Examination duration is **2 Hour**

MMUST observes ZERO tolerance to examination cheating

This Paper Consists of 3 Printed Pages. Please Turn Over.

**QUESTION 1 (30 Marks)**

- (a) In your own opinion briefly discuss how management of Water Resources for drought conditions can be achieved. [15 Marks]
- (b) Two types of structural alternatives are proposed for flood control: upstream flood storage reservoir with a design life of 65 yrs and channel protection through dyke formation with a design life of 40 years. The Cost and benefits are tabulated below. Given the interest, depreciation and administrative cost to be 15%, 2.5% and 0.7% of the Capital cost. Which of the two plans is more economical using the Cost-Benefit analysis method [15 Marks]

S/No.	ITEMS	Reservoir Cost(Ksh.) $\times 10^7$	Channel Cost(Ksh.) $\times 10^7$
1	Preliminaries (including designs)	3.5	2
2	Construction site offices and other buildings	2	1
3	Tools and Plants	3	1
4	Earth works (river diversions, excavations, etc)	9	3
5	Structural Work	90	20
6	Canal lining and outlet formations	2	8
7	Embankment formations	22	14
8	Environmental and Ecology	3	2.5
9	Communication	0.8	0.7
10	Maintenance	16	8.5
11	Miscellaneous expenses	3	2
12	Annual Irrigation Benefits	40.5	18.5
13	Annual flood protection benefits (Human, Structural)	24.5	15.5
14	Recoveries (Buildings, tools, plants and Vehicles)	1.5	0.5
15	Capital Value of land for offices after end of project	1	0.5

**QUESTION 2 (20 Marks)**

- (a) Differentiate between
- i. Net water supply and stable water supply [4 Marks]
  - ii. Gravity dams and Earth Dams [4 Marks]
- (b) An attempt is made to supply water from a river of discharge  $3.5\text{m}^3/\text{s}$  for irrigation scheme. A total flow of  $0.6\text{m}^3/\text{s}$  of water is supposed to be diverted by a broad

crest weir with an upstream square corner and spanning the full width of a small stream of 4.5m. The proposed crest length is 2.4 and the crest elevation is 2.2m above the bed. Calculate the water surface elevation up-stream of the weir. Assume the initial  $C_d=0.545$  [12 Marks]

**QUESTION 3 (20 Marks)**

- (a) Discuss the significance of studying Engineering economics [ 2Marks]  
 (b) Discuss the essence of Water Resources projects Planning and the FIVE stages involved [18 marks]

**QUESTION 4 (20 Marks)**

- (a) Briefly discuss the causes and consequences of Groundwater overdraft [10 Marks]  
 (b) Given the climate change and erratic weather pattern, it has become absolutely necessary to practice Rain water harvesting as means of addressing SDG goal No.1,2, 3 and 6, especially in ASAL areas in Africa. Discuss.

**Some Useful Formula:**

$C_d = 0.028\left(\frac{H_1}{B_w}\right) + 0.521$  for broad crested weir, and  $C_d = 0.120\left(\frac{H_1}{B_w}\right) + 0.492$  for narrow-crested weir