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**MASINDE MULIRO UNIVERSITY OF  
SCIENCE AND TECHNOLOGY  
(MMUST)**

**MAIN CAMPUS**

**SUPPLEMENTARY UNIVERSITY EXAMINATIONS  
2021/2022 ACADEMIC YEAR**

**FIFTH YEAR SECOND SEMESTER SUPPLEMENTARY  
EXAMINATIONS**

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

**COURSE CODE: CSE 552**

**COURSE TITLE: GROUNDWATER ABSTRACTION AND  
RECHARGE**

**DATE: 7<sup>TH</sup> OCTOBER, 2022**

**TIME: 9- 11 A.M**

**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 2 Printed Pages. Please Turn Over.*

**QUESTION 1 [30Marks]**

- (a) Discuss in detail the impact of Climate Change on Groundwater recharge and abstraction [10 Marks]
- (b) Discuss the Cable tool method in drilling a well [20 Marks]

**QUESTION 2 [20 Marks]**

The use of wastewater for groundwater recharge has become very popular in the recent past as the water availability declines globally. Briefly discuss, including the various methods used and major parameters in consideration [20 Marks]

**QUESTION 3 [20Marks]**

- (a) Discuss the following artificial recharge methods
- (i) Multiple basin method [5 Marks]
  - (ii) Recharge well method [5 Marks]
  - (iii) Ditch and Furrow method [5 Marks]
- (b) A well having a static water level 15m below the ground level is to be pumped at a discharge of  $60\text{m}^3/\text{h}$  for a drawdown of 5.0m. Water has to be delivered direct to a point 30m above ground level. Friction losses through the pipes and bends are estimated to be 9% of static water level. Determine the H.P of the pump required, assume an overall efficiency of 70% (motor, pump and system) and peak hour demand of 1.5 times the average. [5 Marks]

**QUESTION 4 [20Marks]**

Discuss in detail the Screen sizing and role played by gravels in coarse-textured unconsolidated aquifer to enhance screening and efficiency of a borehole/well [20 Marks]