



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

**MAIN CAMPUS**

**UNIVERSITY MAIN EXAMINATIONS  
2023/2024 ACADEMIC YEAR**

**THIRD YEAR FIRST SEMESTER EXAMINATIONS**

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

**COURSE CODE: CSE 323**

**COURSE TITLE: HIGHWAY MATERIALS**

**DATE: 11<sup>TH</sup> DECEMBER 2023**

**TIME: 8 A.M – 10 A.M**

**INSTRUCTIONS:**

1. This paper contains **FOUR** sections
2. Answer questions **ONE** and **any other two**
3. Marks for each question are indicated in the parenthesis.
4. Examination duration is **2 Hours**

MMUST observes **ZERO** tolerance to examination cheating

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

**QUESTION 1: (30 MARKS) COMPULSORY**

- (a) Briefly describe the difference between cement and lime soil stabilization. **(6 marks)**
- (b) Outline any FOUR advantages of modified bitumen binders. **(4 marks)**
- (c) You are the Engineer in charge of a proposed road project under design. As part of the process, you are required to carry out a survey of materials along the proposed road alignment.
- (i) What are some of the alignment soil properties (any FOUR) you will be looking into. **(4marks)**
- (ii) What tests will you carry out to ascertain the properties mentioned in section i above (mention the tests and their significance). **(8 marks)**
- (d) Outline the three basic principles of soil stabilization. **(3 marks)**
- (e) (i)What is soil stabilization **(1 mark)**  
 (ii)You have been appointed Roads Engineer for Kakamega county and as part of your assignment, you are in charge of designing a low volume road to connect two small shopping centres. Your assessment determines that the sub-grade soil needs stabilization. What method of stabilization would you recommend to use and why **(4 marks)**

**Question 2: 20 marks**

- (a) What is fully blown bitumen **(1 mark)**
- (b) Softening point is one of the tests used to ascertain properties of bitumen. Define it and briefly describe it, mentioning why it is important **(5 marks)**
- (c) In selecting the most suitable aggregates to use for road construction, mention, briefly describe any four qualities you will look out for. For each quality described mention any one laboratory test that can be carried out to determine if the aggregates possess the quality. **(8 marks)**
- (d) Bitumen as a binder material can be used in various forms. What is the advantage of using it in emulsion form. **(3 marks)**
- (e) Differentiate between straight run bitumen and blown bitumen **(3 marks)**

**Question 3: 20 marks**

- (a) In some cases, the use conventional bitumen may not meet the desired requirements
- (i)What are some of the circumstances under which this may occur **(2 marks)**
- (ii)What is the remedy under the circumstances mentioned above **(2 marks)**

- (b). What is the difference between flexible and rigid pavements, differentiate in terms of mode of load transfer **(4 marks)**
- (c). What are the functions of a surfacing course layer in flexible pavements **(3 marks)**
- (d). Quality control is critically important for the success of any road construction project. Name and discuss the functions of three key players that are needed for this to happen. **(9 marks)**

**Question 4: 20 Marks**

- (a) Outline any five qualities and an ideal pavement should meet. **(5 marks)**
- (b) Differentiate between surface and binder course layers of a flexible pavement. In each case mention one function of the layer and the common materials used for its construction. **(4 marks)**
- (c) Outline the three main factors that affect Sub-grade soil characteristics. **(6marks)**
- (d) Outline any FIVE properties of mechanically stabilized soils. **(5 marks)**