



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

**MAIN CAMPUS**

**UNIVERSITY EXAMINATIONS  
2019/2020 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: MONDAY 20<sup>TH</sup> JANUARY 2020 TIME: 3.00 – 5.00 PM**

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**INSTRUCTIONS:**

1. This paper contains SIX questions
2. Answer any FIVE Questions
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 2 Printed Pages. Please Turn Over.*

**Question 1 (20 marks)**

- a) What are the main components of a typical pavement structure. Describe the function of each component with illustrations. (15 marks)
- b) What is cement stabilization and bitumen stabilization in highways? (5 marks)

**Question 2 (20 marks)**

- a) Explain the following tests for bitumen (10 marks)
- (i) Specific gravity
  - (ii) Softening point test
  - (iii) Penetration test
  - (iv) Float test
  - (v) Viscosity test
- b) What are the different types of macadam roads that are of great importance in modern highway construction (10 marks)

**Question No.3 (20 marks)**

- a) Explain how you would determine the suitability of aggregates to used in a bituminous pavement. (5 marks)
- b) What are the basic properties and functions of the following in a bituminous mixture
- (i) Coarse aggregate
  - (ii) Fine aggregate
  - (iii) Filler material
- (12 marks)
- c) Why is it necessary to carry out a CBR test of the subgrade ? Discuss (3 marks)

**Question 4 (20 marks)**

- a) How would you carry out the mix design for asphaltic/bituminous pavements (10 marks)
- b) What is the procedure for determination of design asphaltic content (10 marks)

**Question 5 (20 marks)**

- a) Explain the procedure you would use on a construction site to ensure that the required 'Macadam' road is realized (10 marks)
- b) What is the principal difference between penetration-grade, cut-back and emulsion bitumen (9 marks)
- c) What do you understand by a tack coat? (1 mark)

**Question 6 (20 marks)**

- a) By use of diagrams describe the manufacturing process of road tar. (6 marks)
- b) What is the Marshall test for Bituminous paving mixtures (8 marks)
- c) What is procedure for preparation of bituminous mixture by cold mixing method (6 marks)