(*University of Choice*)

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

MAIN CAMPUS

UNIVERSITRY EXAMINATIONS 2019/2020 ACADEMIC YEAR

FOURTH YEAR FIRST SEMESTER EXAMINATIONS

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

COURSE CODE: CSE 443

COURSE TITLE: PAVEMENT DESIGN

DATE: MONDAY 20TH JANUARY 2020 TIME: 12.00 – 2.00 PM

INSTRUCTIONS:

1. This Paper Consists of SIX Questions
2. Attempt any FIVE Questions
3. It is to the best interest of the candidate to write legible
4. Examination duration is **2 Hours**

MMUST observes ZERO tolerance to examination cheating

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

1) a. A pavement should meet a certain number of minimum requirements. State three and briefly explain them. **(6 marks)**

b. Using illustrations, differentiate between the two types of pavements explaining how loads are transmitted in each case **(8 marks)**

2) a. Describe the factors that affect the stability of road pavements **(6 marks)**

b. Briefly describe the concept of the behavior of a two layered system according to Burmister's theory **(4 marks)**

c. Using the following data compute the expected surface deflection of the sub-grade under the centre of the tyre using the Burmister's two layer theory. **(4 marks)**

Tyre pressure = 10kg/cm^2
Radius of contact = 15cm
Pavement thickness = 45cm
Modulus of elasticity of paving materials= 1200kg/cm^2
Modulus elasticity of sub-grade material= 120kg/cm^2

3) a.Define the following terms and give their mathematical formulations **(4 marks)**
Equivalence factor
Equivalent standard axle

b. What is the main limitation of the group index method of flexible pavement design **(2 marks)**

c. Design a two lane highway given the following data. The CBR of the sub-grade is 5%. The average daily traffic expected (in each direction) when the road is opened is as follows: 100 passages of 4 axle vehicles each exerting a force of 89KN through each of the two rear axles, 71KN on the second axle and 27KN on the front axle. 200 passages of 3 axle vehicles with loads of 89KN on each of the two rear axles and 18KN on the front axle. 100 passages of 2 axle vehicles with 80KN on the rear and 27KN on the front axle. Considering a design life of 20 years and traffic growth rate of 3% per annum. Design the pavement structure using the Road Note 29 method. **(8 marks)**

4) a. Differentiate between the labour based and mechanized methods of pavement construction. **(4 marks)**
b. Outline the objectives and importance of the following methods of design; design for maintenance and design for construction. **(4 marks)**

c. Explain various joints adopted in the construction of rigid pavements. Use illustrations where necessary **(6 marks).)**

5) a. Maintenance activities of flexible pavements may be classified in terms of their operational frequency as? **(3marks)**

b. Name and describe five routine maintenance activities for flexible pavements **(11 marks)**

6) a. Mention 8 environmental issues concerning the construction of highways **(4 marks).**

b. Briefly describe five mitigation measures that can be used to counter the issues mentioned in (a) above. **(10 marks)**