



TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT BUILDING AND CIVIL ENGINEERING

UNIVERSITY EXAMINATION FOR:

BSC IN CIVIL ENGINEERING

ECE 2412: HIGHWAY ENGINEERING II

END OF SEMESTER EXAMINATION

SERIES: APRIL 2016

TIME: 2 HOURS

DATE: 09 May 2016

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, Drawing Instruments, Scientific calculator, examination pass and student ID

This paper consists of five questions. Attempt question ONE (Compulsory) and any other TWO questions.

Question One (Compulsory)

- a) Using a neatly labeled sketch, describe a flexible pavement and clearly explain the functions and parameters of the principle layers. (11 marks)
- b) A new road is to be designed with the following factors:
- | | |
|--------------------------|------------|
| Growth Rate | = 3% |
| Number of standard axles | = 2500 |
| Design Life | = 20 years |
- Calculate the cumulative number of standard axles (5 marks)
- c) Describe three ways in which water can penetrate into the subgrade soils and how you can prevent the entrance. Use neat sketches to illustrate your explanations. (10 marks)
- d) State the main functions of the following components of Dense Bituminous mix
- Fine aggregates
 - Coarse Aggregates

- iii. Filler
- iv. Binder (4 marks)

Question Two

- a) State the functions of the four joints in rigid pavements. (6 marks)
- b) Outline seven advantages of rigid pavements. (7 marks)
- c) Explain the three assumptions made when calculating stress, strain and deflection in flexible pavement. (3 marks)
- d) Mention the three types of stresses in rigid pavements and explain the principle function of steel in rigid pavement. (4 marks)

Question Three

- a) What is the primary aim of pavement design and, what leads to the instability of the subgrade? (5 marks)
- b) Mention the three common pavement design methods and explain one method in detail. (15 marks)

Question Four

- a) What is “stage construction” and why is it mostly applicable in developing countries? (4 marks)
- b) Briefly explain the four basic earthworks operations, mentioning suitable plants used in each operation. (10 marks)
- c) Explain the three aspects of surface drainage that the road engineer is particularly concerned about. (6 marks)

Question Five

- a) Describe the four common types of road maintenance. (12 marks)
- b) What are the main failures of bituminous surfacing and how do they occur? (8 marks)