



TECHNICAL UNIVERSITY OF MOMBASA
**Faculty of Engineering &
Technology**

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

UNIVERSITY EXAMINATION FOR DECREE IN:

BACHELOR OF SCIENCE IN CIVIL ENGINEERING (BSCE)

ECE 2412: HIGHWAY ENGINEERING II

END OF SEMESTER EXAMINATION

SERIES: APRIL 2015

TIME ALLOWED: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- Answer Booklet
- Pocket Calculator

This paper consists of **FOUR** questions. Answer question **ONE (COMPULSORY)** and any other **TWO** questions

Maximum marks for each part of a question are as shown

Use neat, large and well labeled diagrams where required

This paper consists of **TWO** printed pages

Question One (Compulsory)

- a) Differentiate a flexible pavement from a rigid pavement **(2 marks)**
- b) Mention the **THREE** assumption which are considered when calculating stress, strain and deflection in pavement design **(3 marks)**
- c) Describe with the help of sketches, how CBR is determined and explain why a sample is soaked for **FOUR** days before testing it **(7 marks)**
- d) Mention the **THREE** types of stresses in rigid pavements and explain how these stresses can be controlled **(6 marks)**
- e) (i) Outline “Growth rate” and “Design life” as concern the roads design **(3 marks)**

- (ii) A new road is proposed to have a design life of 15 years, average daily number of standard axles of 2,000 with an annual growth rate of 5%. Calculate the cumulative number of standard axles
(9 marks)

Question Two

- a) Outline the FIVE functions of bituminous surfacing (5 marks)
- b) Explain the importance of the following factors which are considered in pavement design:
(i) Traffic loading
(ii) Climate
(iii) Materials characteristics (7 marks)
- c) Describe THREE ways in which water can enter the sub-grade soil and outline how you would control this entrance (8 marks)

Question Three

- a) Explain the advantages of labour intensive techniques as compared to equipment techniques in construction industry. (5 marks)
- b) Explain the term ‘stage construction’ and give reasons why it is applicable in developing countries (4 marks)
- c) Explain the FOUR categories of Roads maintenance and outline the main objectives of roads maintenance (6 marks)
- d) Highway construction plants are grouped into THREE categories. Name the categories and give ONE example in each category (5 marks)

Question Four

Write short notes on the following stabilization techniques:

- a) Mechanical stabilization
b) Cement stabilization
c) Lime stabilization
d) Bituminous stabilization (20 marks)

Question Five

- a) Explain the following basic earthworks operation:
(i) Clearing and grubbing operations
(ii) Excavation operations
(iii) Finishing operations (6 marks)
- b) Explain the function of each of the FOUR layers of flexible pavements and state the factors considered in layer thickness design (14 marks)