



TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY DEPARTMENT OF BUILDING & CIVIL ENGINEERING UNIVERSITY EXAMINATION FOR: BACHELOR OF SCIENCE IN CIVIL ENGINEERING

ECV 4507: HIGHWAY ENGINEERING II **PAPER 1**

END OF SEMESTER EXAMINATION

SERIES: JANUARY 2025

TIME: 2 HOURS

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of five questions.

Attempt question ONE (Compulsory) and any other TWO questions.

Do not write on the question paper.

QUESTION ONE (COMPULSORY) 30 Marks

- With aid of sketches discuss the use of side gutters and catch water drain in road surface drainage systems (10 Marks)
- State the four assumptions of the Boyd and Foster semi-rational method of finding the Equivalent single wheel load (ESWL) (4 Marks)
- With aid of clear sketches, outline the procedure for finding the Equivalent single wheel load (ESWL) for equal stress criteria by Boyd and Foster semi-rational method (10 Marks)
- A set of dual tyres has a total load of 4090 KN, a contact radius a of 114 mm and a centre to centre tyre spacing of 343 mm. Find the ESWL by Boyd & Foster method for a depth of 343 mm (6 Marks)



ANSWER ANY TWO QUESTIONS FROM THIS SECTION

QUESTION TWO (20 Marks)

- a) A new road is proposed to have a design life of 20 years, average daily number of standard axles of 1,500 with an annual growth rate of 4%. Calculate the cumulative number of standard axles (9 marks)
- b) Outline four basic phases of structural deterioration for a flexible pavement (8 Marks)
- c) State three functions of a subbase in a pavement, (3 marks)

QUESTION THREE (20 Marks)

- (a) State the THREE inherent deficiencies of Road Note 29 that led to its revision by LR1132. (6 Marks):
- (b) Outline the FOUR point design criteria adopted by LR1132 in revising RN29 by redefining pavement failure, thereby delivering a thicker but longer lasting highway likely to be in a less deteriorated state after 20 years. (8 Marks)
- (c) Calculate the cumulative number of standard axles for designing a new pavement with annual average daily traffic for commercial vehicles on the opening day as 2000, Growth rate 4%, Design life 20 years and Damage factor 3.5 (6 Marks)

QUESTION FOUR (20 Marks)

With the aid of neat sketches, illustrate the stress and temperature distribution for a flexible pavement under the application of a wheel load. (20 Marks)

QUESTION FIVE(20 Marks)

With the aid of diagrams illustrate the use of the following rigid pavement joints (20 Marks)

- (i) Contraction joint
- (ii) Expansion joint
- (iii) Warping joint
- (iv) Construction joint