



(University of Choice)

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

MAIN CAMPUS

UNIVERSITY SUPPLEMENTARY/ SPECIAL EXAMINATIONS
2021/2022 ACADEMIC YEAR

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

COURSE CODE: CSE 443

COURSE TITLE: PAVEMENT DESIGN

DATE: 3RD OCTOBER 2022

TIME: 12- 2 P.M

INSTRUCTIONS:

1. This paper contains **two** sections
2. Answer **all** questions in **section I** and **any two** from section **II**
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 4 Printed Pages. Please Turn Over.

SECTION I: ANSWER ALL QUESTIONS (30 MARKS)

- a) For the design of flexible pavements, the strength of the sub-grade plays an important role, explain why that is the case **(4 marks)**
- b) Using the following data obtained from a two lane carriageway, and assuming a design period of 15 years and a subgrade CBR is 5%. Design the pavement using the Road note 29 design method **(10 marks)**

Data from 2011

Axle load (KN)	Number of axles/passes
20	150
40	120
60	80
80	80
100	50
120	40

Data from 2016

Axle load (KN)	Number of axles/passes
20	320
40	200
60	160
80	160
100	120
120	90

- c) There two approaches to pavement design. Empirical and mechanistic. Differentiate between them **(4 marks)**
- d) Differentiate between functional and structural performance in pavements and explain what engineers consider in design and why **(6 marks)**
- e) Layered theory approach to analysis of flexible pavements is the approach widely used. Describe the main working principle of this approach. **(6 marks)**

SECTION II: ANSWER ANY TWO QUESTIONS (40 MARKS)

1. (a) Outline the role of the following in the design of flexible pavements **(10 marks)**

- Traffic load
- Traffic volume
- Climate
- Material characteristics
- Economy

(b) Describe the phenomenon of thermal warping in concrete. What are the main factors that influence the magnitude of thermal warping stresses in concrete **(10 marks)?**

2. (a) State and briefly explain any four assumptions on which the general analytical layer theory approach is based. **(6 marks)**

(b) Calculate the surface deflection under the centre of a tyre ($a = 150\text{mm}$, $p = 552\text{kPa}$) for a 450mm pavement having a 450MPa modulus and a subgrade modulus of 50MPa from two-layer theory. **(4 marks)**

(c) In the design of flexible pavements what are the main design objectives. Mention and briefly describe any four **(10 marks)**

3. (a) Name and briefly describe any five types of pavements used in construction of rigid pavements **(10 marks)**

(b) There are two methods used in the design of rigid pavement thickness. State and briefly describe them highlighting the main differences between them **(10 marks)**

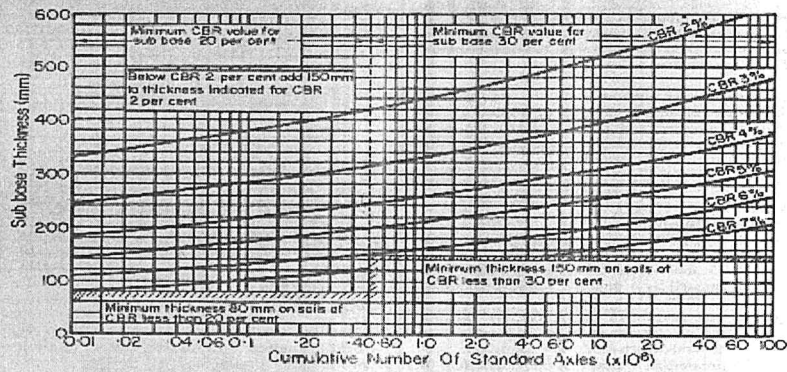


Fig. 6.27 Design chart for sub-base thickness (RN 29).
[Source: reference (8)]

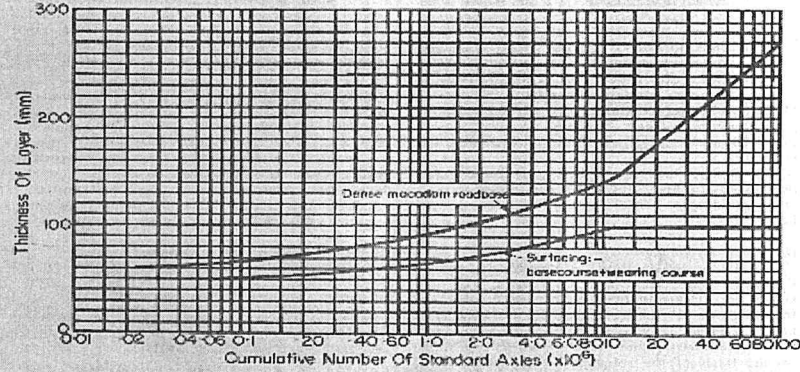


Fig. 6.28 Design chart for surfacing and base thickness for dense macadam bases (RN 29).
[Source: reference (8)]

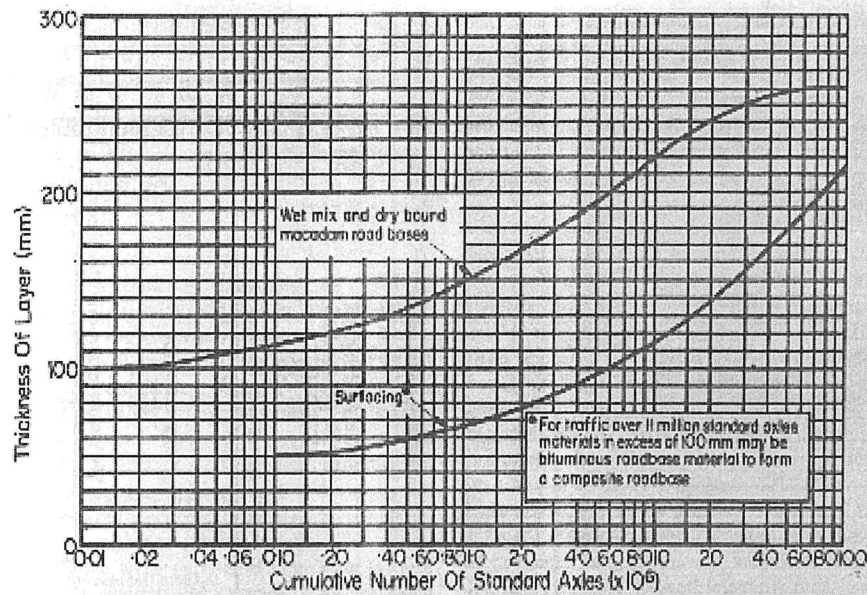


Fig. 6.29 Design chart for surfacing and base thickness for wet-mix and dry-bound macadam bases (RN 29).
[Source: reference (8)]