



(University of Choice)

**MASINDE MULIRO UNIVERSITY OF
SCIENCE AND TECHNOLOGY
(MMUST)**

MAIN CAMPUS

UNIVERSITY EXAMINATIONS

2021/2022 ACADEMIC YEAR

THIRD YEAR FIRST SEMESTER EXAMINATIONS

FOR THE DIPLOMA

IN

CIVIL ENGINEERING

COURSE CODE: DCE 083

COURSE TITLE: HIGHWAY ENGINEERING II

DATE: FRIDAY 29TH APRIL 2022 TIME: 8.00AM – 10.00AM

INSTRUCTIONS:

- i. Answer Question **ONE** and any other **TWO** Questions.
- ii. Marks for each question are indicated in the parenthesis.
- iii. Examination duration is **2 Hours**

MMUST observes **ZERO** tolerance to examination cheating

This Paper Consists of 6 Printed Pages. Please Turn Over.

SECTION A – COMPULSORY (30 MARKS)

Question One

- a) Define the term highway pavement. (2 Marks)
- b) Explain **four** requirements of a good pavement. (8 Marks)
- c) Give **three** differences between flexible and rigid pavements (6 Marks)
- d) Differentiate between cut-back bitumen and bitumen emulsions (4 Marks)
- e) A double lane highway is to be constructed for the present traffic load of 2500 cvpd at the time of construction with an estimated traffic growth rate of 7%. The highway is to be designed for a life time of 20 years. The CBR value of subgrade is 5% with a dense macadam roadbase. Design the flexible pavement as per Road Note 29. Adopt number of standard axles per commercial vehicle as 1.08. (10 Marks)

SECTION B (40 MARKS)

Question Two (20 Marks)

- a) Explain the following defects in rigid pavements (4 Marks)
- i. Mud pumping
 - ii. Shrinkage cracks
- b) Explain **three** desirable properties of bitumen used in highway construction (6 Marks)
- c) CBR test was conducted for soil subgrade and the following results were found.

Load (Kg)	Penetration (mm)
60	2.5
82	5

The following materials are to be used over the soil subgrade: Compacted soil of CBR 6%, poorly graded gravels of CBR 12%, well graded gravels of CBR 60%, Bituminous surface of thickness 4 cm. Given that the wheel load is 4085 kg and the tyre pressure as 7Kg/cm^2 , use the CBR method to determine the following:

- i. CBR of the subgrade

ii. Thickness of the pavement.

iii. The thickness of individual pavement layers.

(10 Marks)

Question Three (20 Marks)

a) Highlight **five** routine maintenance practices carried out throughout the pavement lifetime. (5 Marks)

b) Outline the procedure for repairing a pot hole using asphalt concrete by hot mix plant. (7 Marks)

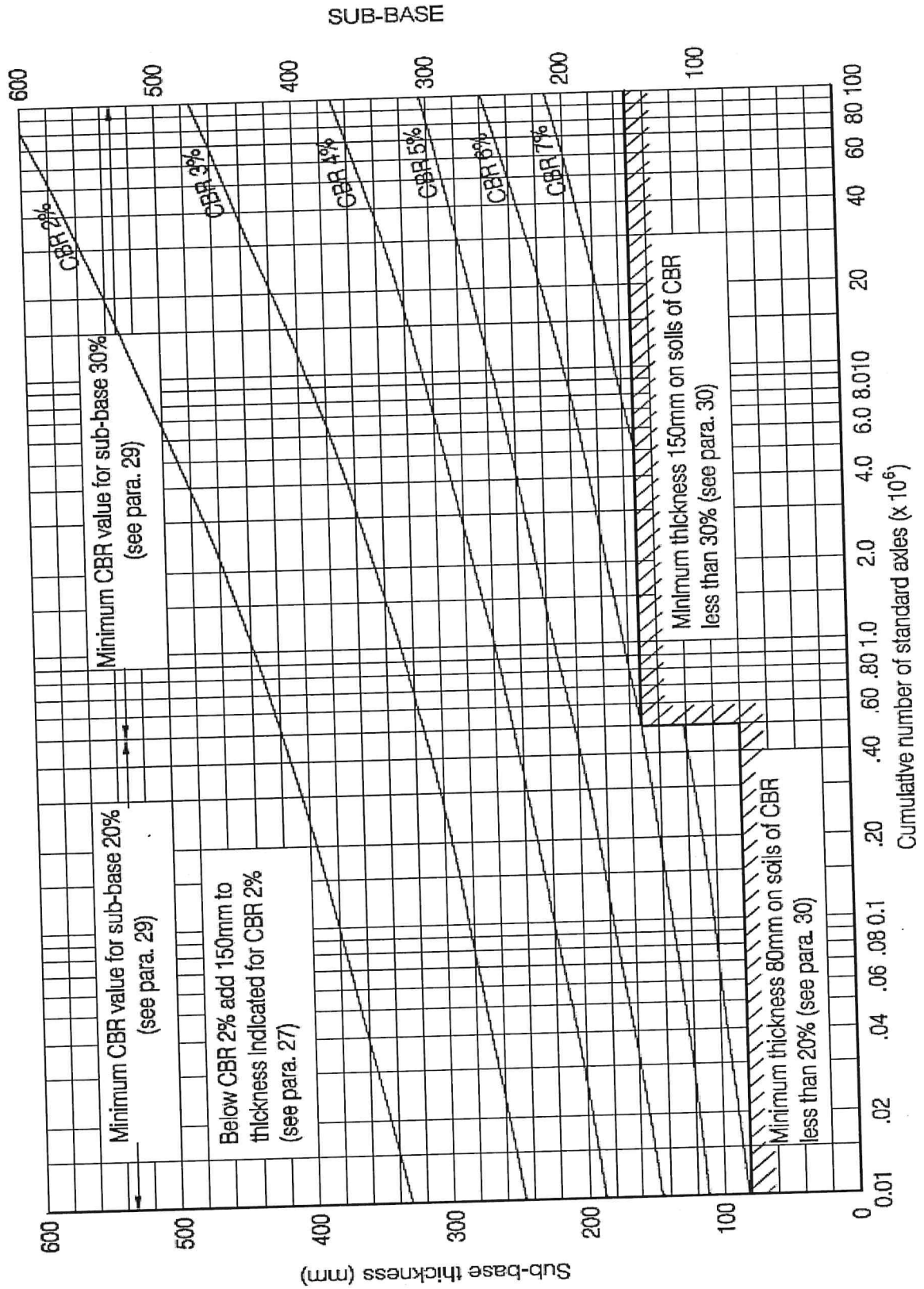
c) Explain **four** types of joints in rigid pavements (8 Marks)

Question Four (20 Marks)

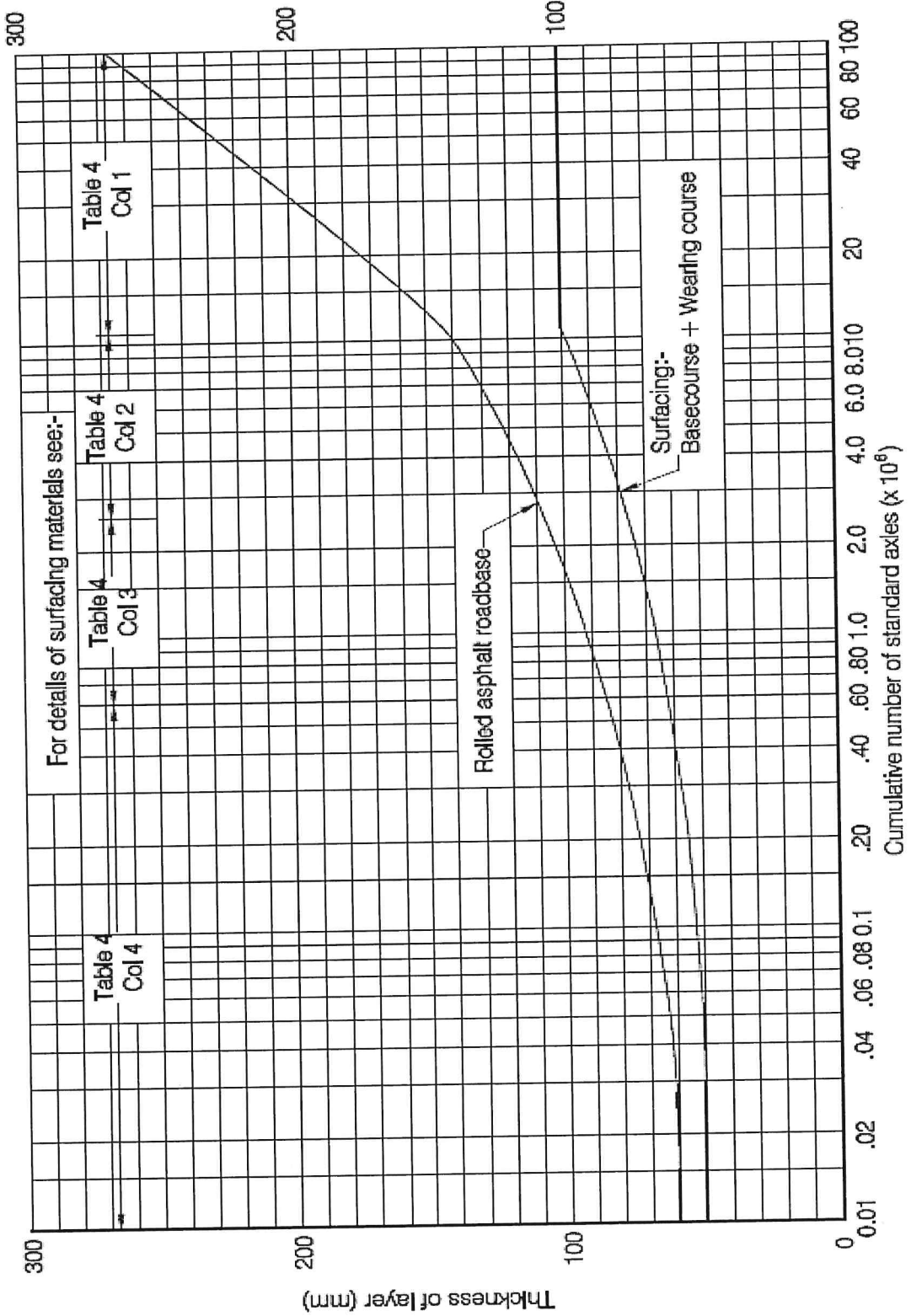
a) State **two** advantages of vibrating smooth wheeled rollers (2 Marks)

b) Describe the **three** basic components of the highway pavement (6 Marks)

c) Describe the construction procedure of a flexible pavement. (12 Marks)



DENSE MACADAM ROAD BASE



**RECOMMENDATION FOR BITUMINOUS SURFACING IN ROAD NOTE 29,
(TRAFFIC IN CUMULATIVE STANDARD AXLES, 10^6)**

	<i>Over 11</i>	<i>2.5—11</i>	<i>0.5—2.5</i>	<i>Less than 0.5</i>
1. Wearing course of minimum 40 mm thickness	Wearing course of minimum 40 mm thickness	Wearing course of minimum 20 mm thickness	Wearing course of minimum 20 mm thickness and suitable base course in a two course construction.	OR
2. Base course of 60 mm thickness	Base course of suitable thickness	Base course of suitable thickness	Single course construction of 60 mm bituminous or tar macadam.	