



ZIMBABWE

**MINISTRY OF HIGHER AND TERTIARY EDUCATION,
INNOVATION, SCIENCE AND TECHNOLOGY DEVELOPMENT**

**HIGHER EDUCATION EXAMINATIONS COUNCIL
(HEXCO)**

NATIONAL CERTIFICATE

**IN
CIVIL ENGINEERING**

MODULE: Road Designing

PAPER NO: 313/22/M07

DURATION: 3 Hours

NOVEMBER/DECEMBER 2025 EXAMINATION

REQUIREMENTS

Calculator

INSTRUCTIONS TO CANDIDATE

- 1. Answer any five (5) questions.**
- 2. Start each question on a fresh page.**
- 3. Show all workings.**

QUESTION 1

- a) Discuss four (4) stages done in the initial costing procedure for a planned way. (8marks)
- b) Show your understanding on the following surveys
 - i) Reconnaissance surveys. (4marks)
 - ii) Topographic surveys. (4marks)
 - iii) Map study (4marks)

QUESTION 2

- a) Describe the design principles of vertical curves. (10marks)
- b) With the aid of a diagram, describe a flexible pavement. (10marks)

QUESTION 3

- a) Critically analyze the following with the aid of sketches:
 - i) Horizontal curve (4marks)
 - ii) Transition curve (4marks)
 - iii) Super elevation (4marks)
 - iv) Highway capacity (4marks)
 - v) Level of service (4marks)

QUESTION 4

- a) Design a pavement for construction of a new by pass with the following data:
- Two lane single carriage way.
 - Initial traffic in the year of completion of construction =400(sum of both directions).
 - Traffic growth rate =7,5%
 - Design life =15years
 - Vehicle damaged factor based on axle load survey =2, 5 standard axle per commercial vehicle.
 - Design CBR of sub graded soil = 5%.

Cumulative ESA	$<0,1 \times 10^6$	$0,1-0,3 \times 10^6$	$0,3-0,1 \times 10^6$	$>1,0 \times 10^6$
Pavement Group	0,1m	0,3m	1,0m	3,0m

(8marks)

- b) Show your understanding on the following terms as used in a pavement design.
- Camber (2marks)
 - Culvert (2marks)
 - Sieve (2marks)
 - Reverse curve (2marks)
 - Super elevation (2marks)
 - Contour map (2marks)

QUESTION 5

- Geotechnical investigations are pivotal to road designs and construction. Describe the CBR test. (10marks)
- Briefly explain the Atterberg limits. (10marks)

QUESTION 6

- a) Briefly describe the following types of sight distances as used in road design.

i) Passing sight distance (PSD) (5marks)

ii) Stopping sight distance (SSD) (5marks)

- b) Determine the angle of the super elevation for 200m highway curve so that there will be no slide thrust at a speed of 90km/hr.

Take $g = 9,81, \text{ kg m / s}^2$

$\mu = 0,15$

(10marks)

.../dk