ZIMBABWE

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

HIGHER EDUCATION EXAMINATIONS COUNCIL (HEXCO)

NATIONAL DIPLOMA

IN

CIVIL ENGINEERING

MODULE: Highway Engineering **PAPER NO: 578/23/M03**

DURATION: 3 Hours

MAY/JUNE 2025 EXAMINATION

REQUIREMENTS

Scientific calculator and answer booklet.

INSTRUCTIONS TO CANDIDATE

1. **Answer any five questions.**
2. **Start each question on a fresh page.**
3. **Do not write anything on the question paper.**
4. **Do not tear off pages from the answer booklet.**

This paper consists of 3 printed pages.

PAPER NO: 578/23/M03 – HIGHWAYS ENGINEERING

QUESTION 1

(a) Explain sight distance and factors causing restriction to sight distance. (5 marks)

(b) Draw a neat sketch of overtaking zone with all detail for overtaking and overtaken vehicles. Speeds are 80km/h and 65km/h. The average rate of acceleration in 3.6km/h/sec. The road is a single lane both directions. (15 marks)

QUESTION 2

For the road cross sections tabulates below, calculate the total volume of both cut and fill between chainage *CHO* and *CH 623*. Allow 10% extra materials due to compaction and reduction . Calculate the mass haul diagram ordinates and plot the mass –haul- diagram to a suitable scale.

CH	Area CUT (m^2)	Area fill (m^2)
0	0	
50	22	
100	47	
150	46	
200	28	
250	12	
300	1	
350		3
400		34
450		57
500		52
550		48
600		21
623		7

if the free haul distance is 300m calculate the volumes of freehaul and overhaul.

Calculate the volume of borrow or waste. (20 marks)

QUESTION 3

Write short notes on the following:

(a) Soil stabilising agents (5 marks)

(b) Difference between cutback and emulsion (5 marks)

(c) Aggregates (5 marks)

(d) CBR test (5 marks)

QUESTION 4

(a) Describe the factors considered when designing a culvert. (10 marks)

(b) Explain the steps taken in culvert sizing and design. (10 marks)

QUESTION 5

Describe the sources of highway project funding. (20 marks)

QUESTION 6

(a) Outline the factors influencing the geometric design of highways. (10 marks)

(b) Describe the environmental impacts of highways on local communities. (10 marks)

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