



ZIMBABWE

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

**HIGHER EDUCATION EXAMINATIONS COUNCIL
(HEXCO)**

NATIONAL DIPLOMA

IN

WATER RESOURCES ENGINEERING

SUBJECT: Hydraulic Structural Design

PAPER NO: 588/22/S04

DURATION: 4 Hours

NOVEMBER/ DECEMBER 2025 EXAMINATION

REQUIREMENTS

1. Calculator
2. Answer booklet.

INSTRUCTIONS TO CANDIDATES

1. Answer any four (4) questions.
2. All questions carry equal marks.
3. Begin each question on a fresh page.

This paper consists of 3 printed pages.

QUESTION 1

- a) Define the following terms as used in hydraulic structural design:
- | | | |
|------|------------------|-----------|
| i) | Laminar flow | (3 marks) |
| ii) | Turbulent flow | (3 marks) |
| iii) | Steady flow | (3 marks) |
| iv) | Uniform flow | (3 marks) |
| v) | Non-uniform flow | (3 marks) |
- b) Describe the functions of a spillway on a dam or reservoir. (10 marks)

QUESTION 2

- a) Describe the effects of sedimentation in Hydraulic structure. (15 marks)
- b) Outline any two (2) types of dams. (5 marks)
- c) Outline any five (5) factors affecting dam site selection. (5 marks)

QUESTION 3

Given the following, information calculate the volume of earthworks required in the construction of Chivi dam:

Upstream slope-1.5:1

Downstream slope – 2:1

Intervals – 3m, 4m, 4m, 3m, 6m

Height – 0m, 2m, 4m, 5m, 5m, 6m

(25 marks)

QUESTION 4

Discuss the environmental impacts of a dam project in area of your choice.
(25 marks)

QUESTION 5

- a) Describe the functions and design consideration of the following structural elements in hydraulic structures:
- i) Beam (5 marks)
 - ii) Column (5 marks)
 - iii) Slab (5 marks)
 - iv) Foundation (5 marks)
- b) Outline the components of a typical water retaining structure. (5 marks)

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