ZIMBABWE

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

HIGHER EDUCATION EXAMINATIONS COUNCIL (HEXCO)

NATIONAL DIPLOMA

IN

WATER RESOURCES ENGINEERING

SUBJECT: Water and Wastewater Engineering PAPER NO: 588/22/S05

DURATION: 3 Hours

NOVEMBER/DECEMBER 2025 EXAMINATION

REQUIREMENTS

Pen and pencil.

INSTRUCTIONS TO CANDIDATE

1. **Answer ANY FIVE (5) questions.**
2. **All questions carry equal marks.**
3. **Start each question on a new page.**
4. **Do not tear off any pages from answer booklet.**
5. **Do not write on question paper.**

This paper consists of 3 printed pages.

PAPER NO: 588/22/S05 – WATER AND WASTEWATER ENGINEERING

QUESTION 1

(a) State any three objectives of any public water supply system. (3 marks)

(b) In a piped water scheme, what is the purpose and recommended location of each of the following:-

(i) wash out valves (2 marks)

(ii) air valves (2 marks)

(iii) break pressure tank (2 marks)

(iv) gate valve (2 marks)

(v) fire hydrants (2 marks)

(c) Explain the Hardcross method of solving the pipe network, by balancing heads and correcting flow. (7 marks)

QUESTION 2

Using clear diagrams, explain in detail the stages followed during water treatment from the source to the consumer. (20 marks)

QUESTION 3

(a) State any five biological water quality parameters. (5 marks)

(b) Give a detailed explanation of the following methods as used in the enumeration of coliform organisms

(i) Multiple Tube Fermentation Technique (5 marks)

(ii) The membrane Filter Technique (5 marks)

(iii) The Direct Counts (5 marks)

QUESTION 4

(a) Define the following terms:-

(i) Sullage (2 marks)

(ii) Black water (2 marks)

(b) Define the term Environmental Impact Assessment (EIA) and highlight its functions on a water supply project. (6 marks)

(c) With reference to any waste water treatment plant of your choice, explain in detail the stages of waste water treatment. (10 marks)

QUESTION 5

(a) State any five types of water demand. (5 marks)

(b) The following data shows the variation in population of a town from 1922 to 1972.

Year	1922	1932	1942	1952	1962	1972
Population	72 000	85 000	110 500	144 000	184 000	221 000

Estimate the population of the city in the year 2002 using:-

(i) Arithmetical increase method (5 marks)

(ii) Geometrical increase method (5 marks)

(iii) Incremental increase method (5 marks)

QUESTION 6

(a) Explain the following as used in sewer reticulation network testing

(i) Air test (5 marks)

(ii) Water test (5 marks)

(b) Describe and explain the applications of the Environmental Management Authority Act to water engineering projects. (10 marks)

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