ZIMBABWE

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

HIGHER EDUCATION EXAMINATIONS COUNCIL (HEXCO)

HIGHER NATIONAL DIPLOMA

IN

CIVIL ENGINEERING

SUBJECT: Water and Sanitation Engineering II

PAPER NO: 778/17/S05

DURATION: 3 Hours

MARCH/APRIL 2021 EXAMINATION

REQUIREMENTS

Scientific calculator.

INSTRUCTIONS TO CANDIDATE

1. Answer ANY FOUR (4) questions.
2. Start each question on a fresh page.

This paper consists of 3 printed pages.

QUESTION 1

(a) List any five (5) components of a water supply complex. (5 marks)

(b) Give any five factors to consider when selecting a site for intakes. (5 marks)

(c) A two – stage centrifugal pump has a rated duty of 22 l/s at 1450 rev/min against 40m head.

Determine the specific speed and the number of additional stages required to obtains a specific speed of about 30. Assuming that a motor operation at 1200 rev/ min is available, estimate for the original pump the revised head and discharge at optimum efficiency. (10 marks)

(d) Write short notes on the following

(i) Reflux valves (2 marks)

(ii) Float valves (2 marks)

(iii) Boosters (1 mark)

QUESTION 2

(a) List four factors considered when selecting pipe material. (4 marks)

(b) Identify any three surface and three underground water sources. (6 marks)

(c) Describe and explain the three types of filters used in water treatment. (15 marks)

QUESTION 3

(a) Distinguish between coagulation and flocculation. (4 marks)

(b) What are the merits and demerits of impounding water on water quality? (8 marks)

(c) Water treatment has 3 main stages and processes which are ion transfer, solute stabilisation and solid transfer. Explain what happens during each process. (13 marks)

QUESTION 4

(a) Distinguish between aerobic digestion and anaerobic digestion of sewerage sludge. (4 marks)

(b) Describe what takes place in the following stages of sewer treatment

(i) primary treatment (2 marks)

(ii) secondary treatment (2 marks)

(c) What are the four common methods of irrigation used in Zimbabwe? (4 marks)

(d) Work out the capacity of a sprinkler system to apply water at the rate of 1.5cm/hr. Two sprinkler lines 200m long each with 18 sprinklers are spaced at 11m intervals on each line. The sprinkler lines are spaced at 16m intervals. (5 marks)

(e) Describe how the following affect irrigation frequency

(i) soil characteristics (4 marks)

(ii) crop characteristics (4 marks)

QUESTION 5

(a) Defining the scope of the EIA is possibly the most important task of the whole process as it effectively sets the agenda for the rest of the study. How is the scoping exercise undertaken? (5 marks)

(b) Highlight some of the potential environmental effects and issues which are likely to arise during the project of a dam construction. (5 marks)

(c) What are the advantages of the scoping exercise in an EIA? (5 marks)

(d) Justify the need of an EIA for any engineering project. (5 marks)

(e) State the factors that affect the choice of an EIA method. (5 marks)

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