



**NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY**

**FACULTY OF ENGINEERING**

**DEPARTMENT OF CIVIL AND WATER ENGINEERING**

**PART V SUPPLEMENTARY EXAMINATION**

**WATER RESOURCES MANAGEMENT ECW 5205**

**AUGUST 2024**

This examination paper consists of 4 pages

**Time Allowed: 3 hours**

**Total Marks: 100**

**Examiner's Name: Eng K Z Mkwanaenzi**

**INSTRUCTIONS**

1. Answer any 4 questions
2. Each questions carries 25 marks

**MARK ALLOCATION**

Question 1 - 25 marks

Question 2 - 25 marks

Question 3 - 25 marks

Question 4 - 25 marks

Question 5 - 25 marks

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## **QUESTION 1**

### *Integrated Water Resources Management (IWRM)*

- a) What is your understating of the stated goal of Integrated Water Resources Management (IWRM) with due regard to Sustainable Development Goals (SDGs). (5 marks)
- b) List and describe the four principles from the 1992 Dublin Water Conference guiding IWRM (8 marks)
- c) Present and qualify in detail a successful case study of any national government-funded integrated water resources management plan/strategy that culminated in water use and management efficiency and sustainable development in the past 10 years in any Sub-Saharan Africa country of your choice (12 marks)

## **QUESTION 2**

### *Water Demand Management*

- a) Describe formulae and tools you would use at your disposal as a Water Demand Manager at the Dept of Water Affairs and Environment for the following water demands projections:
  - i) Public water supply projections (3 marks)
  - ii) Irrigation and hydropower projections (3 marks)
  - iii) Mining operations and industrial production projections (3 marks)
- b) How would you make a balance between a supply-oriented and demand-oriented approach in dealing with water challenges in a developing, industrial city like Bulawayo with due regard to citizens needs and large water-using industries. Describe in detail engineering tools and social campaigns and policies you would implement in dealing with water supply shortfalls, temporary and future measures – Also considerations should be made to Global Climate Change issues and exhaustion of new alternative water supply resources. (16 marks)

**(Total marks 25)**

### **QUESTION 3**

*Surface and Groundwater Resources Management in Zimbabwe - Focus on the New Water Act*

- a) List and describe in detail five critical functions of an appointed catchment council in terms of the new Zimbabwe Water Act. ( 10 marks)
- b) List and describe five actions or powers of authority given to an appointed catchment councils in term of above Act, (10 marks)
- c) You have been appointed as a catchment manager of a river basin, Describe in detail all economic and sustainable development considerations you would analyze in approving more than one application for a water permit/ water use license for the same water resource.

(5 marks)

**(Total marks 25)**

### **QUESTION 4**

Water Resources Planning - Analytical Framework

- a) Briefly describe the three phases in Water Resources Development and illustrate with a diagram or sketch ( 9 marks)
- b) The recycling or use of reclaimed water from sewage treatment works is to be given a new life line by the City of Bulawayo (Cob), considering the needs of big water users like the Zimbabwe Power Company (Bulawayo Power Station) and municipal sports facilities and recreation grounds,

With the aid of a table list the objectives and evaluation criteria that you would consider and adopt before going ahead and fully implementing the above proposed project, noting non-governmental organization assistance in terms of external funds that have been offered by VEI company from The Netherlands to CoB in a Public Private Partnership (PPP) ( 16 marks)

**(Total marks 25)**

## QUESTION 5

### *Water Pricing*

- a) With the aid of a diagram illustrate the Composition of Water price ( 9 marks)
- b) The willingness to pay for a service and more specifically the cost of water can be observed with consumer behaviour when the unit cost is gradually increased. OECD recommendations are that the water user should be required to pay the full social cost of providing water and related services, including treatment and damage costs
- i) In relation to b) above how would you justify the recovery of the provision costs of water to downstream users in a rural resettlement farming scheme in the Mazowe Catchment Valley  
(8 marks)
- ii) How will you justify and implement increased block tariff water costs in the high density residential suburbs of the city of Bulawayo, where household incomes are low and alternative water sources like borehole water are not readily available (8 marks)

**(Total marks 25)**

**END OF EXAMINATION**