



**NATIONAL OPEN UNIVERSITY OF NIGERIA**  
**FACULTY OF SCIENCES**  
**DEPARTMENT OF ENVIRONMENTAL SCIENCE AND RESOURCE MANAGEMENT**  
Plot 91, Cadastral Zone, Nnamdi Azikwe Expressway, Jabi, Abuja  
**2024 1 EXAMINATION**

**COURSE CODE:** ESM 322  
**COURSE TITLE:** WATER AND WASTEWATER MANAGEMENT  
**CREDIT:** 2 Units  
**TIME ALLOWED:** 2 Hours

**Instruction:** Attempt question number ONE (1) and any other TWO (2) questions. Question number one (1) carries 30 marks, while the other questions carry (20) marks each.

**QUESTION 1**

- i. List five water contaminants and discuss their effects on man (7.5mks)
- ii. Differentiate between water guidelines and standards (3mks)
- iii. What is the essence of wastewater treatment? (2mks)
- iv. With a diagrammatic sketch, give a description of water softening system (13.5mks).
- v. What is the difference between water softening system and reverse osmosis? (4mks)

**QUESTION 2**

- i. Discuss on five water treatment (10mks)
- ii. Discuss on SIX (6) symptom and the means of transmissions of water borne diseases (4mks)
- iii. Discuss on the three (3) sources of water pollutant basic on their drainage discharge (6mks)

**QUESTION 3**

- i. Discuss on the history water treatment (5mks)
- ii. Differentiate between Granular activated carbon (GAC) and Solid block activated carbon filters (SBAC) (4mks)
- iii. Describe the on-site disposal and treatment system and discuss on the two (2) components of on-site sewage disposal system (6mks)
- iv. Mention the two (2) inorganic and three (3) disinfection by product chemicals of primary maximum contaminant with their level limit (5mks)

**QUESTION 4**

- i. State at least five water treatment technology (2.5mks)

- ii. State the five (5) different level of water treatment and their objectives. (5mks)
- iii. Discuss on the five (5) different types of secondary treatment system (12.5mks)

#### QUESTION 5

- i. Describe water and water pollution (2mks).
- ii. Mention five sources of wastewaters (2.5mks,  $\frac{1}{2}$  on each)
- iii. Discuss on five (5) major types/forms of water pollutant (5mks)
- iv. Sketch the secondary wastewater treatment plant and describe five stages, applications, advantages and disadvantages of it (10.5mks)

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