



UNIVERSITY EXAMINATIONS
FOURTH YEAR EXAMINATION FOR THE AWARD OF
THE DEGREE OF BACHELOR OF SCIENCE IN RENEWABLE ENERGY

SECOND SEMESTER 2021/2022
(FEBRUARY – JUNE, 2022)

PHRE 422: OTHER RENEWABLE ENERGY SOURCES II

STREAM: Y4 S2

TIME: 2 HOURS

DAY: MONDAY, 12:00 PM – 2:00 PM

DATE: 16/05/2022

INSTRUCTIONS

- 1. Do not write anything on this question paper.***
- 2. Answer Question ONE (Compulsory) and any other TWO Questions.***

QUESTION ONE

- Devices that are used in **tidal energy generation** vary in size, shape and specifications. State and explain the **three** types used. (9 marks)
- Give an expression that can be used to calculate the power generated from tidal stream generators. Explain the terms used in the expression. (3 marks)
- (i) Define the term '**wave energy converter**' (WEC) (2 marks)
(ii) **State** and **explain** the **three types** of wave Energy Converters (6 marks)
- Highlight the **three** parameters which determine the amount of energy stored in waves hence state the formula used in the calculation of the amount of energy stored in waves. (4 marks)

- e. State the **three main** elements that make up a geothermal system. (3 marks)
- f. Briefly explain how **geothermal energy** is used in **the generation of electric power**. (3 marks)

QUESTION TWO

- a. Discuss the following types of geothermal resources (8 marks)
- (i) Convective hydrothermal resource
 - (ii) Geopressured
 - (iii) Radiogenenic
 - (iv) Hot Rock resources
- b. State and explain **four main direct** applications of geothermal energy. (8 marks)
- c. Discuss the impact of geothermal energy on natural phenomena, wildlife and vegetation. (4 marks)

QUESTION THREE

- a. State and explain the **three** types of locations for **wave energy** converter placement. (6 marks)
- b. Outline four **main** components of the wave energy technologies. (4 marks)
- c. Discuss the advantages of utilizing wave energy (3 marks)
- d. Discus two main **benefits** and **limitations** of exploiting tidal power (4 mark)
- e. Explain three most important variables that are generally considered when identifying a suitable site for development of a tidal energy extraction. (3 marks)

QUESTION FOUR

- a. With the aid of flow/block diagrams and equations, discuss the **three main OTEC** strategies used to convert ocean energy to a form of useful energy to human needs. (9 marks)
- b. State **five advantages** of ocean thermal energy in relation to the exploitation of the Ocean Conversion Thermal Technology (OTEC). (5marks)

- c. Discuss **three challenges** associated with the Ocean Thermal Technologies. (6 marks)

QUESTION FIVE

- a. State **two** types of tidal current turbines that are used to extract the kinetic energy from currents to generate electricity (2 marks)
- b. Explain **five negative aspects** of using ocean energy (5 marks)
- c. Explain the **four commercial types** of geothermal power plants. (8 marks)
- d. Discuss how geothermal energy can offset other environmental impacts. (5 marks)