



(University of Choice)

**MASINDE MULIRO UNIVERSITY OF
SCIENCE AND TECHNOLOGY
(MMUST)**

MAIN CAMPUS

UNIVERSITY EXAMINATIONS

2021/2022 ACADEMIC YEAR

FIRST YEAR SECOND SEMESTER EXAMINATIONS

FOR THE DEGREE

OF

**BACHELOR OF SCIENCE IN RENEWABLE ENERGY
TECHNOLOGY**

COURSE CODE: RET 102

COURSE TITLE: INTRODUCTION TO ENERGY TECHNOLOGY

DATE: 27.04.2022

TIME: 3PM-5PM

INSTRUCTIONS TO CANDIDATES

1. This paper consists of **FOUR** questions
2. Answer Question **ONE (Compulsory)** and any other **TWO** Questions
3. All symbols have their usual meaning

TIME: 2 Hours

MMUST observes **ZERO** tolerance to examination cheating

This Paper Consists of 4 Printed Pages. Please Turn Over

QUESTION ONE**[30 marks]**

- A) Describe 4 barriers that faces the large scale utilization of bioenergy (4 Marks)
- B) Describe six factors that have led to accelerated development of wind power (6 Marks)
- C) Draw a well labelled schematic diagram of a typical hydroelectric power plant (4 Marks)
- D) A fan of power 50W is used 8 hours per day and a TV of power 40W is used 6 hours per day. What is the energy consumption of a fan and TV per month of 30 days? (3 Marks)
- E) 20.0 grams of ^{32}P that decays 5% daily. Calculate the duration it will take for half the original to decay (2 Marks)
- F) Determine the tip to speed ratio and power conversion coefficient for a rotor diameter 90 m, the rotor rotates at 0.198 Hz. The rated power output for the turbine model is 3 MW at 15 ms^{-1} . (5 Marks)
- G) Briefly discuss the three different types of tidal power plants (6 Marks)

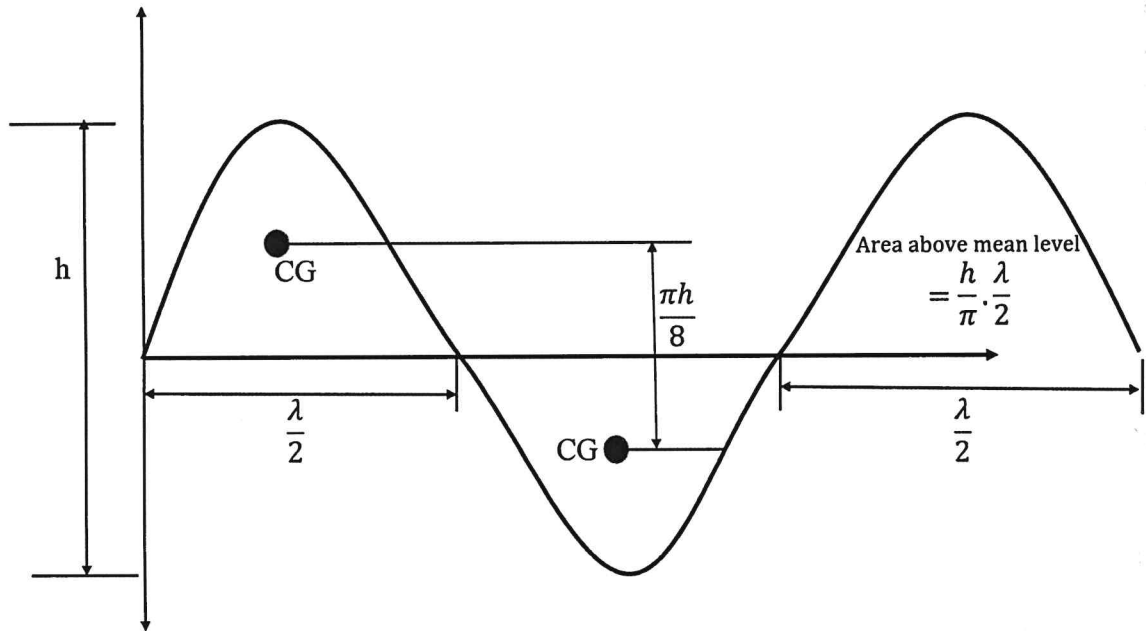
QUESTION TWO**[20 marks]**

- A. Discuss 6 challenges encountered in wind power generation (12 Marks)
- B. A company in Kenya is interested in using offshore wind turbines for generating renewable energy. They plan to use wind turbines with
- I. a rated power of 5 MW;
 - II. rated speed of 15 rpm
 - III. a rotor diameter of 120 m

Assuming, the mass density of air is $\rho=1.3 \text{ kgm}^{-3}$, and the power coefficient conversion efficiency is $C_p=0.5$. Determine the rated wind speed (the wind speed at which the turbine reaches rated power). mechanical and electrical losses in the generator system may be neglected. (8 Marks)

QUESTION THREE**[20 marks]**

- A. Explain the FIVE disadvantages of nuclear energy (5 Marks)
- B. Based on the Figure below, given that $\lambda = \frac{gT^2}{2\pi}$ deduce the wave power per unit length. (7 Marks)



C. Using a well labelled diagram, describe the functions of various parts of a fission reactor (8 Marks)

QUESTION FOUR

[20 marks]

- A) Identify the 6 main challenges encountered in implementing wave energy projects (6 Marks)
- B) Explain whether or not Kenya should invest in tidal energy (8 Marks)
- C) Using a well labelled diagram describe the following processes; (i) nuclear fission process and (ii) nuclear fusion process (6 Marks)

