



JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF ENGINEERING AND TECHNOLOGY

**UNIVERSITY EXAMINATION FOR THE DEGREE IN SCIENCE IN RENEWABLE
ENERGY TECHNOLOGY AND MANAGEMENT**

1ST YEAR 1ST SEMESTER 2023/2024 ACADEMIC YEAR

CENTRE: MAIN CAMPUS

COURSE CODE: TEB 1101

**COURSE TITLE: INTRODUCTION TO RENEWABLE ENERGY TECHNOLOGY AND
MANAGEMENT**

EXAM VENUE:

STREAM: BSc. REN ENGY TEC & MGT

DATE: /12/2023

EXAM SESSION:

DURATION: 2 HOURS

Instructions

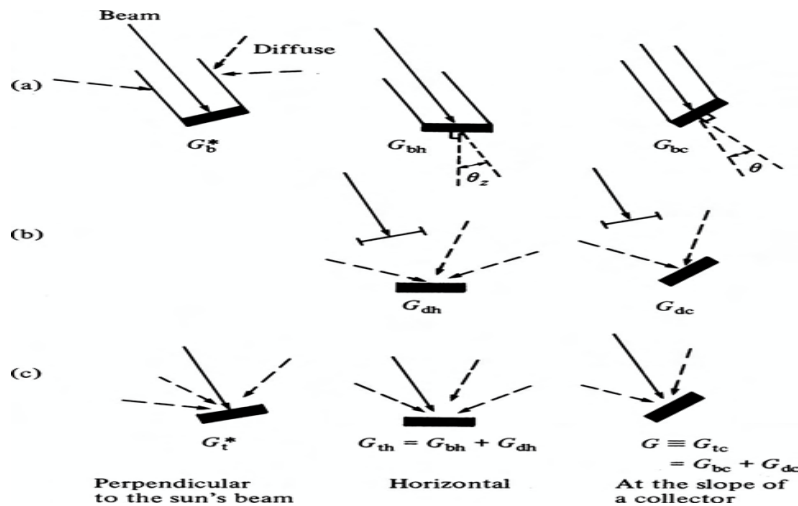
- 1. Answer question 1 (Compulsory) and ANY other two questions**
- 2. Candidates are advised not to write on question paper**
- 3. Candidates must hand in their answer booklets to the invigilator while in the examination room.**

QUESTION ONE – A (Compulsory)

In the figure below the capital letters with the subscripts are the various components of solar radiation: i) identify the subscripts (3 Marks)

ii) Suggest in a), b) and c) the type of solar radiation that is blocked (3 Marks)

iii) And respectively in a), b) and c) name the type of radiation that is referred to by the subscripts. (9 Marks)



QUESTION One – B (Compulsory)

As the solar short wave radiation passes through the Earth's atmosphere, a set of interactions do occur.

- Explain with an aid of a diagram the term direct and diffuse beams. (5 Marks)
- Expound on the Terms Green House effect and Reflection of the extraterrestrial solar intensity (6 Marks)
- The solar short wave and the atmospheric long wave spectral distributions are divided into regions or limits that helps in explaining the important absorption processes. Name the five divisions and explain any one of them. (4 Marks)

QUESTION Two

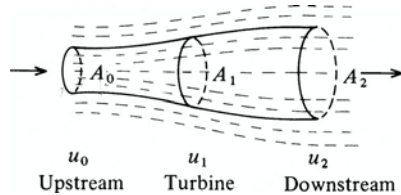
Geothermal energy comes from down the depth of the earth to the land surface as a function of temperature. In the scenario;

- Sketch a section through depth of the earth showing i) section names ii) depth of the layers iii) and average temperature of the sections (7 Marks)
- Name the known region(s) where i) the energy are harnessed ii) geothermal energy turbines are mostly embedded iii) hot springs or spars are likely to be found or located iv) likely the region where your county falls in (name your county) (5 Marks)
- In b(i) the regions further have classes; i) name the three classes ii) and explain for each class how the energy is normally extracted at the surface of the earth (8 Marks)

QUESTION Three

(3a) Given the Betz model (below) of an expanding air stream as below and the equation

$F = \dot{m} u_0 - \dot{m} u_2$; where \dot{m} = mass flow rate, u_0 / u_2 are respectively velocities at upstream and downstream of the model. The airstream velocity is constant and has a laminar flow.



In four steps; show that; $u_1 = 0.5 (u_0 + u_2)$ (8 Marks)

(3b) A hydraulic ram is an example of a hydropower device use mostly in remote rural areas; Sketch the device and explain chronologically at least the first five steps of its operation principle. (12 Marks)

QUESTION Four

- Name and explain how the two most common compounds responsible for creation of acid rain are formed in the atmosphere. (2.5 Marks)
- Explain how the two compounds contribute to the process of creation of the acid rain. (2.5 Marks)
- Name and explain five aspects that indicate the effects of acid rain. (5 Marks)
- How is global warming an “unfair affair”, for the developing world with respect to developed parts of world? (10 Marks)

QUESTION Five

Renewable energy is reorganized as a vital input for future sustainability

- List the four questions that are normally asked in or for their practical applications. (4 Marks)
- Which of these questions have relationship with a) technical issues b) Planning; social responsibility and sustainable development c) and what question dominate the consumers and thus a criterion for commercial installations. (3.5 Marks)
- For us to understand or appreciate the cost effectiveness of renewable Energy, name the three major issues that need to be considered. (6 Marks)
- List the six distinctive scientific principles of renewable energy. (2 Marks)
- Matching of renewable energy supply to end-use (demand) is accomplished by control of machines, devices and systems. Name and explain the three possible categories of control (4.5 Marks)