JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF ENGINEERING AND TECHNOLOGY

UNIVERSITY EXAMIMATION FOR THE DEGREE IN SCIENCE IN RENEWABLE ENERGY TECHNOLOGY AND MANAGEMENT

1ST YEAR 1ST SEMESTER 2022/2023 ACADEMIC YEAR

CENTRE: MAIN CAMPUS

COURSE CODE: TEB 1101

COURSE TITLE: INTRODUCTION TO RENEWABLE ENERGY & MANAGEMENT

EXAM VENUE: **STREAM: BSc. REN ENGY TEC & MGT**

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 1

a. List and explain the three classes of a geothermal region. **(7.5 Marks)**
b. Name and explain the three methods that are normally used for the heat extraction in the three classes.
c. Write the equation for increase of temperature T with depth Z; thereby explaining the meaning of the parameters or the variables **(8.5 Marks)**
d. Then develop an equation containing temperature T_1 (the effective temperature) with respect to energy (heat quantity) and depth Z. **(10 Marks)**
e. Last; sketch the profile of hot dry rock system for the above for calculating the heat (the parameters include Surface temperature (T_a), effective temperature and effective depth (Z_1, T_1), temperature at maximum depth T_2 , change in depth (,∂) and area A. **(4 Marks)**

QUESTION 2

(See Appendix A for the diagrams)

i. In diagram (a) row one; name the five types of wind turbines (2.5).
ii. In row two; name the five wind turbine with respect to wind approach direction, specifically also identifying the type (2.5 Marks),
iii. What type of wind turbine are these in group (a – (1 Mark)
iv. In diagram (b) name the six types of wind turbines and the group type of wind turbines (3.5 Marks)
v. State the equation for an identified suitable site for a wind turbine production (include the meaning of the parameters); Also state the significance of each of the parameters in the equation with respect to wind turbine performance. (9.5 Marks)
vi. Mention any one disadvantage of the vertical wind turbines (1 Mark)

QUESTION 3

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

a) Define the terms direct and diffuse beams from the sun with an aid of a Sketch diagram (5 marks)
b) Expound on the Terms Green House effect with reference to flow of solar energy and atmospheric effects. (6 Marks)
c) 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. Explain any of the two divisions. (9 Marks)

QUESTION 4

a) State the equation for an identified suitable site for hydropower production (include the meaning of the parameters). (3 Marks)
b) Name the five methods of determining Q for a given site and explain the simplest method of the five for a small flow. (5 Marks)

Hydrological cycle (source of Hydro power) is a model that describes the storage and movement of water between the biosphere, atmosphere, lithosphere and the hydrosphere. Therefore define the following terms;

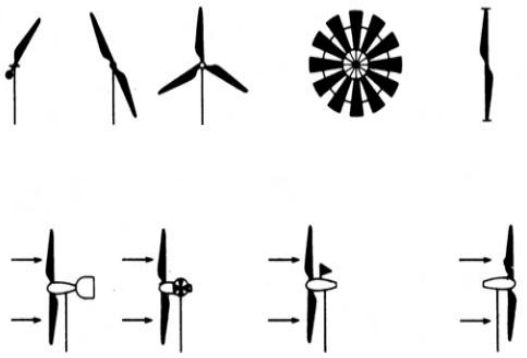
c) Biosphere and hydrosphere. (2 Marks)
d) Condensation, Evapotranspiration, precipitation, runoff and percolation with reference to hydrological cycle. (5 Marks)
e) Draw schematic diagram that self explains the term hydrological cycle. (5 Marks)

QUESTION 5

a) Define the term Biomass, biofuel and explain the meaning of Bioenergy (4.5 Marks)
b) Write down the formulae for a Biomaterial on dry basis moisture content and on wet basis moisture content (3 Marks)
c) What is the moisture content of a bio material when dry and is in equilibrium with the environment (2 Marks).
d) What are the three major classifications and nine general types of biomass energy processes; of the nine types, list them under their own classifications respectively (6 Marks)
e) Explain any one type of biomass energy process in each of the three classifications (4.5 Marks)

APENDIX A

(a)



(b)