



MAASAI MARA UNIVERSITY

REGULAR UNIVERSITY EXAMINATIONS 2017/2018 ACADEMIC YEAR FOURTH YEAR SECOND SEMESTER

**SCHOOL OF SCIENCE
DEPARTMENT OF MATHEMATICS AND PHYSICAL SCIENCES
BACHELOR OF SCIENCE AND BACHELOR OF SCIENCE EDUCATION**

COURSE CODE: PHY 427

COURSE TITLE: SOLAR ENERGY

DATE: 19TH-April 2018 8:30-10:30AM 2 HOURS

INSTRUCTIONS

Answer question **ONE** and **ANY** other **TWO** questions

This paper consists of 3 printed pages. Please turn over.

Part A: Total Possible Marks 30

1. (a). What is the disadvantage of using a fixed solar system. Explain how and what can be used to solve the problem. **(5 marks)**
- (b). Distinguish between a single axis solar tracker and dual-axes solar tracker. Explain one advantage and one disadvantage for each, where applicable. **(5 marks)**
- (c) What is energy as defined in this course? Give the two major types of energy sources and give two examples for every type of energy source. **(7 marks)**
- (d) Distinguish between direct and indirect conversion of solar energy. Use examples to enrich your explanations. **(4 marks)**
- (e) In your own analysis, explain why countries are encouraging their citizens to embrace the renewable energy sources. **(5 marks)**
- (f) Enok a resident of Narok is continuously complaining to you about his high electric bills. What advice can you give him to help him cut his electric bills? **(4 marks)**

Part B: Total Possible Marks 40 (Answer 2 questions)

2. (a) Explain how the sun produces Infrared, Ultraviolet and visible light radiations. **(7 marks)**
- (b) Explain the following terms **(4 marks)**
 - i. Solar constant
 - ii. Solar time
- (c) Why is selective coating important in a absorbers in a solar collector. **(4 marks)**
- (d) Why are copper tubes employed as a riser tube in flat plate collectors? **(5 marks)**
3. (a) What are the basic components of a simple flat plate collector, and how does it work? **(10 marks)**
- (b) What is the disadvantage of using a fixed solar system? Explain how and what can be used to solve the problem. **(5 marks)**

(c) Why is selective coating important in in solar collector absorbers?

(3 marks)

(d) Why are copper tubes employed as a riser tube in flat plate collectors?

(2 marks)

4. (a) What do you understand by the following terms, give their mathematical formulas where possible. **(8 marks)**

- i. Reflectance
- ii. Transmittance
- iii. Photovoltaic cell
- iv. Solar cell efficiency

(b) Calculate the efficiency of a solar cell with an open circuit voltage of 0.611 V, Short circuit current of 3.5 A and fill factor of 0.7, given that the power input is 10 Watts and. **(5 marks)**

(c) From (b) above, calculate the maximum power output of the cell. **(3 marks)**

(d) In a simplified manner, illustrate how a solar tracker works. **(4 marks)**

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