



MACHAKOS UNIVERSITY

University Examinations 2021/2022

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF PHYSICAL SCIENCES

THIRD YEAR FIRST SEMESTER EXAMINATION FOR
BACHELOR OF SCIENCE (APPLIED PHYSICS AND TECHNOLOGY)

SPH 352: SOLAR ENERGY TECHNOLOGY

DATE:

TIME:

INSTRUCTIONS:

Answer question **ONE** which is compulsory and any other **TWO**

SECTION A (COMPULSORY)

QUESTION ONE (30 MARKS)

- (a) Explain the source of sun's abundant energy (3 marks)
- (b) Distinguish renewable and alternative sources of energy, giving examples for each (4 marks)
- (c) Define the terms (i) Solar constant (2 marks)
(ii) Insolation (2 marks)
(iii) Solar tower (2 marks)
- (d) Distinguish between Air-mass zero (AM0) and Air-mass one point five (AM1.5) (2 marks)
- (e) (i) State the three standard conditions for testing solar devices (3 marks)
(ii) Name four standard measurements taken during testing of solar cells (4 marks)
- (f) Explain the challenges of the solar technology industry under the following headings
 - (i) Current challenges (4 marks)
 - (ii) Future challenges (4 marks)

SECTION B (ATTEMPT ANY TWO)

QUESTION TWO (20 MARKS)

- (a) The sun is the prime source of energy, discuss. (10 marks)
- (b) Describe five major ways of harvesting solar energy. (10 marks)

QUESTION THREE (20 MARKS)

- (a) Distinguish between on and off grid photovoltaic (PV) systems. (2 marks)
- (b) Describe four major components of an off-grid PV system. (8 marks)
- (c) You have been requested to install a solar PV system, describe five major factors that you as a professional must consider before the installation. (10 marks)

QUESTION FOUR (20 MARKS)

- (a) Describe 3 major types of solar thermal systems. (6 marks)
- (b) Explain four uses of solar thermal energy. (8 marks)
- (c) Show that the instantaneous efficiency of a solar collector is dependent on the mean temperature.

(6 marks)

QUESTION FIVE (20 MARKS)

- (a) Discuss the benefits of adopting alternative sources of energy (10 marks)
- (b) Compare the first generation solar cells and the emerging technology solar cells. (10 marks)