



MACHAKOS UNIVERSITY

University Examinations 2023/2024 Academic Year

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF PHYSICAL SCIENCES

THIRD YEAR FIRST SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE (APPLIED PHYSICS AND TECHNOLOGY)

SPT 308: SOLAR ENERGY TECHNOLOGY

DATE: _____

TIME: _____

INSTRUCTIONS:

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

SECTION A (COMPULSORY)

QUESTION ONE

- 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

- a) All energy sources derive their energy potential from the sun. With specific examples, discuss the statement for (i) a non-renewable source (2 marks)
- (ii) four alternative sources (8 marks)
- b) Describe five major ways of harvesting solar energy (10 marks)

QUESTION THREE

- 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

- 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

- 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)