



MACHAKOS UNIVERSITY

University Examinations 2017/2018

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

**FIRST YEAR SECOND SEMESTER EXAMINATIONS FOR CERTIFICATE IN
ELECTRICAL AND ELECTRONICS ENGINEERING.**

EPC 119: SOLAR INSTALLATION SYSTEMS

DATE: 11/12/2017

TIME: 8.30-10.30 AM

INSTRUCTIONS

Answer Question One and Any Other Two Questions

- 1 (a) Define the following terms
- (i) Solar Constant
 - (ii) Peak Sun – Hours. (4 marks)
- (b) (i) Differentiate between monocrystalline and amorphous solar cells. (4 marks)
- (ii) Explain with the aid of a labeled diagram the operation of an indirect solar drier. (5 marks)
 - (iii) State any three advantages of using a solar electric system as compared to other sources of energy. (3 marks)
- (c) With the aid of a labeled diagram explain the operation of a PV Solar cell. (6 marks)
- (d) (i) Describe the roof top mounts as a method of mounting structures for modules. (2 marks)

- (ii) Explain any three factors that determine the power output of a solar module. (6 marks)

SECTION B – ATTEMPT ANY TWO QUESTIONS.

2. (a) Define the following terms;
- (i) Rated cycle life
 - (ii) Depth of discharge. (4 marks)
- (b) Describe the properties of a lead – acid automotive battery used in solar systems. (3 marks)
- (c) (i) State Three functions of a charge controller in a solar system. (3 marks)
- (ii) With the aid of a diagram explain the shunt regulator type of charge controller. (6 marks)
- (d) State any Four remedies required during trouble shooting for fixing a battery with a low state of charge. (4 marks)
3. (a) Define the following terms;
- (i) Peak power.
 - (ii) Blocking diode. (4 marks)
- (b) (i) Describe the principle of the Green House effect for collecting solar energy in solar thermal applications. (4 marks)
- (ii) State any Two advantages of a solar box cooker. (2 marks)
- (c) Explain Five steps to be followed when determining the correct size of a solar module to be used in a premise. (10 marks)
4. (a) State the functions of the following components of a solar PV system
- (i) Solar modules.
 - (ii) Charge controller
 - (iii) Inverter. (6 marks)
- b) Explain with aid of a diagram a regulated D.C solar system as a PV system configuration. (4 marks)
- c) Describe the operation of a concentrating type solar cooker. (3 marks)
- d) Explain how the daily system charge requirements is worked out. (7 marks)
5. a) (i) Explain the maintenance procedure for a solar battery. (4 marks)

- (ii) Define Daily load Energy Demand as used in planning and sizing a solar electric system. (2 marks)
- b) A technician was asked by a client to advice on the choice of a solar battery for his domestic installation. Outline the procedure of estimating the rating of the battery giving an example. (6 marks)
- c)
 - (i) State Three factors which necessitates the need for using inverters in PV solar systems. (3 marks)
 - (ii) Explain the Hysteresis mode of control of a charge controller in solar systems. (5 marks)