MACHAKOS UNIVERSITY

University Examinations for 2020/2021 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

FIRST YEAR FIRST TERM EXAMINATION FOR

DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

2601/105/SIT, 2602/105/SIT: SOLAR INSTALLATION TECHNOLGY

DATE: 8/6/2021 **TIME: 8.30-11.30 AM**

INSTRUCTIONS

Answer ALL the questions.

1. a) Explain any THREE methods of mounting a PV module (6 marks)

   b) Explain the main components of a solar PV system. (10 marks)

   c) Define the following terms:

      i. Direct radiation

      ii. Diffusion (4 marks)

2. a) State **any two** functions of a charge controller (2 marks)

   b) With the aid of a circuit diagram, explain the construction of a shunt charge controller. (8 marks)

   c) Explain the (i)connecting and (ii) disconnecting sequence of a charge controller (4 marks)

   d) Draw the connection of three, 12V,50Ah batteries connected in:

      i. Parallel

      ii. Series

   For each case in d(i) and (ii) calculate the total voltage and capacity. (6 marks)

3. a) With the aid of a well labelled diagram, explain the following types of solar PV systems:
   i. Stand-alone, DC loads only (2 marks)
   ii. Stand- alone , both DC and AC loads
   iii. Hybrid system (6 marks)

   b) Explain why dissimilar PV modules should NOT be connected in series (4 marks)

   c) State the possible cause and remedy for each of the following faults in a solar PV installation:
   i. no current flowing from module to battery
   ii. blown fuse. (4 marks)

   d) A solar module rated 150W receives daily insolation of 7 hours/day. The system losses are 20%. Determine the output of the module per (i) day (ii) week. (4 marks)

4. a) Explain the functions of an inverter (3 marks)

   b) With the aid of well labelled diagrams, explain any three types of off-grid inverters. (9 marks)

   c) State any four advantages of solar PV technologies (4 marks)

   d) Explain the term “greenhouse effect” (4 marks)

5. a) State any two factors that affect the output of a solar PV Module. (2 marks)

   b) State three advantages of renewable energy sources (3 marks)

   c) State the standard testing conditions (STC) of a PV module (3 marks)

   d) Explain the different types of Pv modules, stating their efficiencies (10 marks)

   e) State two conversions of solar energy. (2 marks)