UNIVERSITY OF MINES AND TECHNOLOGY, TARKWA

FIRST SEMESTER EXAMINATIONS, NOV/DEC 2018

COURSE NO: RN 277
COURSE NAME: SOLAR PV CELLS AND SYSTEMS
CLASS: RN II **TIME**: 3 HOURS

Name**:** _____Index Number: _____

INSTRUCTION: Answer all Questions

Question 1

(a) Define the following terms:

i. Solar Energy
ii. Solar Altitude
iii. Solar Azimuth

(6 Mks)

(b) State and explain four factors that affect the output (performance) of a solar PV Module.

(8 Mks)

(c) Kumasi is 10^0 N. Calculate the altitude of the sun when it is over the two tropics and the equator. (clue: +/ - 23.45 ^{0}) **(3 Mks)**

(d) What would be the number of peak sun hours if the profile of the power from the sun is as follows? Please show calculation and explain your answer. **(5 Mks)**

Time	Irradiance (W/m^2)
7.00 am - 8.00 am	300
8.00 am - 9.00 am	250
9.00 am - 10.00 am	350
10.00 am - 11.00 am	500
11.00 am - 12.00 noon	600
12.00 noon - 1.00 pm	700
1.00 pm - 2.00 pm	650
2.00 pm - 3.00 pm	500
3.00 pm - 4.00 pm	450
4.00 pm - 5.00 pm	250

(e) A solar cell has a surface area of 50 cm^2. It is receiving irradiance of 1000 W/ m^2. Assume monochromatic light of wavelength 900 nm and a reflection coefficient of 0.9, how many photons per second reach the solar cell? If all the available photons are absorbed, what is the

maximum photocurrent the cell can produce? Taking Speed of light (C) = 3.0 × 10^{8} m/s, Planck's constant = 6.625 × 10^{-34} Js, Electron charge = 1.602 × 10^{-19} C, Energy of Photon = hf. **(8 Mks)**

Question 2

(a) Define the following terms used in solar industry:

i. Etching

ii. Screen Printing

iii. Balance of System

(6 Mks)

(b) State the purpose of the Bypass Diodes and Blocking Diodes. **(4 Mks)**

(c) State five inspections an Engineer/ technician should carry out on Solar PV prior to maintenance. **(5 Mks)**

(d) Differentiate between the main types of batteries **(5 Mks)**

Question 3

(a) Define the following terms used in solar industry:

i. Equalisation ii. Gassing **(4 Mks)**

(b) Differentiate between the effects on batteries when left inactive with low state of charge for long periods. **(4 Mks)**

(c) Explain what disconnects are and state its functions. **(4 Mks)**

(d) State the types of Solar PV Systems and discuss under which conditions that you would select one over the other. **(8 Mks)**

EXAMINER: K. B. OWUSU/ *I. OSEI*