Manmohan Technical University
Office of the Controller of Examinations
Exam Year: 2082, Mangsir(Model Question)

School: SOE	Level: BE	Invigilator's Sign: ………………..
Program: BEEE	Year/Part: IV/I	Superintendent's Sign: …………

Exam Roll: …………………………………………………………………

Exam Roll in words: ……………………………………………………………

Subject: Applied Photovoltaic Engineering (EG714EE)

Code No. …………………………

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Code No. [ ]

i.   Answers should be given by filling the Multiple-Choice Questions' Answer Sheet.
ii.   The main answer sheet can be used for rough work.

GROUP A *(Multiple-Choice Questions)*	[10x1=10]	Time: 20 Minutes

1. Summer solstice occurs on
    a. Dec 21   b. June 21
    c. Sep 21   d. Mar 21

2. For the sun directly overhead, Air mass is
    a. 2   b. 1
    c. 0.5   d. 0

3. Solar cells are made up of
    a. Conductor   b. Insulator
    c. Semiconductor   d. Superconductor

4. With the increase in solar insolation short circuit current _____.
    a. Decreases   b. Increases
    c. Remains constant   d. Both (i) and (ii)

5. Which of the following is not the thin film cell?
    a.Cadmium telluride   b. Gallium arsenide
    c.Single crystal Silicon   d. Indium phosphide

6. Which of the inverter topologies has lowest reliability?
    a) Team concept   b. Master slave
    b) Centralized   d.Multi String

7. Which component is essential for implementing MPPT?
    a. DC-DC Converter   b. Inverter
    c. Solar Panel   d. Battery Storage

8. What is the function of a solar charge controller?
    a. Converts solar energy to electrical energy   b. Regulates the flow of electric current from solar panels to batteries
    c. Stores excess solar energy for later use   d. Monitors the amount of solar energy being produced

9. The technical issue due to high PV penetration level is
    a. Reverse power flow   b. Low utility power factor
    c. Harmonics and flicker   d. All of the above

10. What is the typical depth of discharge (DOD) recommended for lead-acid batteries used in solar power systems?
    a. 20%   b.80%
    b. 50%   d. 100%

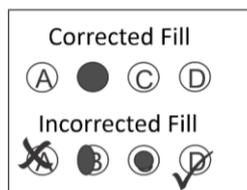---

Multiple Choice Questions' Answer Sheet

Marks Secured: _____

In Words: _____

Examiner's Sign: _____ Date: _____

Scrutinizer's Marks: _____

In Words: _____

Scrutinizer's Sign: _____ Date: _____

Corrected Fill
Ⓐ ● Ⓒ Ⓓ

Incorrected Fill
✗ Ⓑ ● ⦿

1.	Ⓐ Ⓑ Ⓒ Ⓓ	6.	Ⓐ Ⓑ Ⓒ Ⓓ
2.	Ⓐ Ⓑ Ⓒ Ⓓ	7.	Ⓐ Ⓑ Ⓒ Ⓓ
3.	Ⓐ Ⓑ Ⓒ Ⓓ	8.	Ⓐ Ⓑ Ⓒ Ⓓ
4.	Ⓐ Ⓑ Ⓒ Ⓓ	9.	Ⓐ Ⓑ Ⓒ Ⓓ
5.	Ⓐ Ⓑ Ⓒ Ⓓ	10.	Ⓐ Ⓑ Ⓒ Ⓓ

School: SOE	Level: BE	Time: 3 Hours
Program: BEEE	Year/Part: IV/I	Full Marks: 50
Subject: **Applied Photovoltaic Engineering (EG714EE)**		

- ✓ *Candidates are required to give their answers in their own words as far as practicable.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

GROUP A *(Multiple-Choice Questions in separate paper)* **[10×1=10]**

GROUP B *(Short Answer Questions - **Attempt Any Eight**)* **[8×2=16]**

1. What is solar energy? Briefly explain the applications of PV system.
2. Find the altitude angle and azimuth angle for the sun at 3.00 P.M solar time in Biratnagar, Nepal (latitude 26.45°) on march 1 (n=60)
3. Consider a 100 cm^2 photovoltaic cell with reverse saturation current I = 10^{-12} A/cm^2. In full sun, it produces a short-circuit current of 40 mA/cm^2 at 25ºC. Find the open-circuit voltage at full sun and again for 50% sunlight.
4. Compare conventional and modern PV cell technology.
5. What is the concept of Maximum Power Point (MPP) tracking? Explain with the help of flow chart.
6. Draw the schematic diagram of Passive connection of PV system with battery alone and active connection of PV system with hybrid storage.
7. What is islanding? How utility-interactive PV inverter islanding occurs?
8. What are the different components of grid connected PV system?

9. What is linear current booster (LCB). Explain its role in PV powered water pumping.

GROUP C *(Long Answer Questions - **Attempt Any Six**)* **[6×4=24]**

1. Explain the effect of earth atmosphere, orbit and rotation on solar insolation.
2. With the aid of IV curve of a typical PV cell, explain how the internal losses affect the performance of a PV cell. Also explain the impacts of temperature and insolation on its performance.
3. What is the use of inverter in PV application? Explain different types of Inverter topologies used in PV system.
4. What are the main functions of solar charge controller? Explain the charging method used in solar batteries.
5. Discuss the technical issues related to high penetration level on grid connected PV system.
6. Design array size and battery size of a 6 kw Standalone Photovoltaic system of the following given specifications and assume suitable data which is required.
   Average power output = 6 kw into a DC load at a DC voltage of 108 V
   Duration of operation = 24 hrs a day
   Average time of sunlight available = 4.5 hours a day
   Number of sunless days = 2 per week
   Peak value of insolation = 850W/m2
   Maximum depth of discharge of battery = 50%
   Maximum power rating Pmax = 200 Wp
   Rated current Impp = 4.7 A
   Rated voltage Vmpp = 35 V
   Short circuit current Isc = 5.2 A
   Open circuit voltage Voc = 42.8 V
7. For the data given in question No. 6 design charge regulator size, inverter size and wire size of the system.

All The Best