BRAINWARE UNIVERSITY

Term End Examination 2024-2025
Programme – Dip.EE-2022/Dip.EE-2023
Course Name – Solar Power Technologies
Course Code - DEEPE401B
(Semester IV)

Full Marks : 60 **Time : 2:30 Hours**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A
(Multiple Choice Type Question) 1 x 15=15

1. *Choose the correct alternative from the following :*

(i) Choose the correct option: A solar cell converts light energy into _____.
a) Electrical energy b) Thermal energy
c) Sound energy. d) Heat energy

(ii) Identify the series and parallel combination of the solar cell.
a) Solar array b) Solar light
c) Solar sight d) Solar eye

(iii) Choose the correct option: To insure that your PV system will work all the day you should use-
a) Converter b) Battery Storage
c) Solar cell d) None of the above

(iv) Choose the correct option: All the electricity produced by the solar panels is produced as-
a) AC b) DC
c) both AC and DC d) None of the above

(v) Judge the layer that reduces reflection, allowing more sunlight to be absorbed by the solar cells.
a) Glass Layer b) Anti-reflective Coating
c) Back sheet d) All of these

(vi) Select from the following: The solar radiation that reaches the surface without scattering or being absorbed is called-
a) Infrared radiation b) Ultraviolet radiation
c) Diffuse radiation d) Direct radiation

(vii) Select the correct option. The effect of high temperatures on the efficiency of a PV panel is-
a) Increases efficiency b) Decreases efficiency
c) No effect on efficiency d) Efficiency becomes unpredictable

(viii) Identify the true statement about the temperature of the PV panel.

a) PV panel efficiency increases linearly with temperature.
b) Higher temperatures have no impact on PV panel efficiency.
c) Excessively high temperatures can permanently damage PV panels.
d) PV panels are not affected by temperature changes.

(ix) Choose the correct option: The instrument is typically used for measuring solar irradiance-

a) Pyranometer
b) Anemometer
c) Barometer
d) Hygrometer

(x) Select the correct option: Under nominal conditions, the typical solar irradiance level.

a) 500 W/m^2
b) 1000 W/m^2
c) 1500 W/m^2
d) 2000 W/m^2

(xi) Select the hybrid solar power plant that uses lenses or mirrors to concentrate sunlight onto a small area to produce heat for generating electricity.

a) PV only
b) CSP only
c) PV-CSP hybrid
d) Geothermal-solar hybrid

(xii) Select the type of hybrid solar power plant combines solar energy with wind energy to generate electricity.

a) PV only
b) CSP only
c) Wind-solar hybrid
d) Tidal-solar hybrid

(xiii) Select from the following factors that contribute to losses in a PV system.

a) Solar panel efficiency only
b) Inverter efficiency only
c) Both solar panel and inverter efficiency
d) Battery efficiency only

(xiv) Select from the following that is not a factor contributing to resistive losses in a PV system.

a) Resistance in electrical cables
b) Dust and dirt on solar panels
c) Internal resistance of solar cells
d) Resistance in connectors and junction boxes

(xv) Select the correct option: The inclination angle varies between-

a) 0 to 180 degree
b) 180 to 180 degree
c) 100 to 180 degree
d) 90 to 90 degree

Group-B

(Short Answer Type Questions) 3 x 5=15

2. Explain the process to improve energy utilization by hybrid solar thermal plants. (3)
3. Describe the factor that impact solar electricity production. (3)
4. Explain the considerations of voltage measurement in PV instruments. (3)
5. Explain the effect of temperature on the efficiency of a solar panel. (3)
6. Explain the effect of "fill factor" (FF) on PV module efficiency. (3)

OR

Explain the significance of "Imp" on PV module parameters. (3)

Group-C

(Long Answer Type Questions) 5 x 6=30

7. Explain See-beck Effect. (5)

8. Explain the working of Pyranometer. (5)
9. Explain the advantages of parabolic trough power plants. (5)
10. A PV system operates with an efficiency of 17% in an area with an average solar irradiance of 5 kWh/m²/day. Calculate the energy produced daily with a panel area of 20 square (5)

meters.

11. Suppose a PV array comprises 15 strings of solar modules connected in parallel. Each string contains 6 modules connected in series. If the voltage output of each module is 45 volts, estimate the total voltage output of the array. (5)

12. In a location with an average solar irradiance of 7 kWh/m²/day. Estimate the area of solar panels needed to produce 50 kWh of energy per day, assuming a system efficiency of 20%. (5)

OR

Explain the impact of the choice of PV module technology on array sizing and module selection. (5)

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