Reg.No. \_\_\_\_\_\_\_\_\_\_\_\_



**UNIVERSITY**

(Karunya Institute of Technology & Sciences)

(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

**End Semester Examination – Nov/Dec – 2016**

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|  |  | **Semester :** | **2016-17 ODD** |
| **Code :** | **14EE3011** | **Duration :** | **3hrs** |
| **Sub. Name :** | **PHOTOVOLTAIC SYSTEMS** | **Max. marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | Explain the following: Beam and diffuse solar radiation. | CO2 | 4 |
| b. | The hour angle | CO2 | 4 |
| c. | The Sun's declination angle | CO2 | 4 |
| d. | Zenith angle. | CO2 | 4 |
| e. | Azimuth ngle | CO2 | 4 |
| (OR) | | | | |
| 2. | a. | With the help of a neat diagram explain the principle of operation of solar radiation and spectrum of sun geometry. | CO2 | 10 |
| b. | Determine the average value of solar radiation on a horizontal surface on June 22nd which is situated 10◦N. Take a= 0.3, b=0.51 and n/N=0.55 for the place where the average solar radiation is to be calculated. | CO2 | 10 |
| 3. |  | Draw the equivalent circuit of a solar cell and discuss the electrical characteristics of the solar cell. | CO1 | 20 |
| (OR) | | | | |
| 4. |  | Discuss in detail about the effect of temperature on the output of the solar panel with necessary equations. | CO1 | 20 |
| 5. |  | Briefly explain about the terrestrial photovoltaic module and derive an expression for the module current (IM) and series resistance (RSEM). | CO1 | 20 |
| (OR) | | | | |
| 6. | a. | With the help of neat diagrams explain about the mismatches happened in the solar cell/ module because of series and parallel connection of solar cell/module. | CO1 | 12 |
| b. | Describe the principle of working of Lead acid batteries and state its merits and demerits | CO1 | 8 |
| 7. | a. | With the help of neat diagrams explain about the power conditioning circuits used in PV system and derive an expression for voltage gain for the types of DC-DC Converters. | CO1 | 12 |
| b. | Design a PV water pumping system, which is required to draw 20,000 litres of water every day from a depth of 20mt. | CO3 | 8 |
| (OR) | | | | |
| 8. | a. | Design a solar PV System wherein the total load consists of CFL,TV, fan, refrigerator and a computer . The system should allow the use of loads in non-sunshine hours. The operating hours and power rating of these loads are given in the table below.   |  |  |  |  |  | | --- | --- | --- | --- | --- | | S.NO | LOAD | WATTS | H/DAY | NUMBER | | 1 | CFL | 18 | 6 | 3 | | 2 | FAN | 70 | 4 | 2 | | 3 | TV(27”) | 250 | 8 | 1 | | 4 | REFRIGERATOR | 150 | 2 | 1 | | 5 | COMPUTER | 250 | 1 | 1 | | CO3 | 20 |
|  | | **Compulsory:** |  |  |
| 9. | a. | Draw the topologies for a single and multistage grid connected PV Systems. | CO3 | 10 |
| b. | Design the sizing and energy balance of a grid connected Photovoltaic Systems. | CO3 | 10 |

ALL THE BEST