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

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**End Semester Examination – Nov / Dec – 2019**

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| **Code :** | **17EE3014** | **Duration :** | **3hrs** |
| **Sub. Name :** | **PHOTOVOLTAIC SYSTEMS** | **Max. Marks :** | **100** |

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

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | Briefly explain the terrestrial photovoltaic module and derive an expression for the module current (IM) and series resistance (RSEM). | CO4 | 10 |
| b. | Discuss in detail the effect of temperature on the output of the solar panel with necessary equations. | CO1 | 10 |
| **(OR)** | | | | |
| 2. | a. | Draw the equivalent circuit of an ideal solar cell and derive its Fill Factor. | CO4 | 10 |
| b. | Estimate the monthly average daily global solar radiation on the horizontal surface at Coimbatore (11.0168° N, 76.9558° E) during the month of April if the average sunshine hours per day is 10.2. Assume values for a=0.27 and b=0.50. | CO1 | 10 |
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| 3. | a. | With the help of a neat sketch, explain the construction and working principle of Copper Indium gallium diselenide Solar cells. | CO4 | 10 |
| b. | Compare the different types of solar cells with respect to the efficiency, materials and Voltage. | CO4 | 10 |
| **(OR)** | | | | |
| 4. |  | 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 | | CO6 | 20 |
|  |  |  |  |  |
| 5. | a. | Give the various configurations of solar PV hybrid system. Write down the merits and demerits of various configurations. | CO3 | 7 |
| b. | With the help of an example, explain the PV array sizing procedure and battery sizing procedure in a standalone photovoltaic system and draw the graph between CA vs CS. | CO3 | 13 |
| **(OR)** | | | | |
| 6. | a. | Briefly explain the different MPPT methods used in solar PV system. State its advantages and limitations for each method. | CO1 | 10 |
| b. | Describe the principle of working of Nickel Cadmium batteries and state its advantages. | CO1 | 10 |
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| 7. | a. | Draw the circuit diagram of the three phase inverter circuit. Also draw its necessary waveforms and explain the operation of the circuit. | CO1 | 10 |
| b. | Discuss the rural electrification in India. | CO5 | 10 |
| **(OR)** | | | | |
| 8. | a. | Design a PV water pumping system, which is required to draw 20,000 litres of water every day from a depth of 20mt. | CO2 | 10 |
| b. | Briefly explain the building integrated photovoltaic units. | CO5 | 10 |
|  | | **Compulsory:** |  |  |
| 9. |  | With the help of a schematic diagram, describe the construction, design and working model of solar powered aircraft. | CO6 | 20 |