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**SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR**  
(AUTONOMOUS)

**B.Tech IV Year I Semester Regular Examinations February-2022**  
**SOLAR PHOTOVOLTAIC SYSTEMS**

(Open Elective-III)

Time: 3 hours

Max. Marks: 60

**PART-A**

(Answer all the Questions 5 x 2 = 10 Marks)

- |   |   |   |    |    |
|---|---|---|----|----|
| 1 | a | Define Solar constant and what is the value of solar? | L1 | 2M |
|   | b | What is a solar PV module?                            | L1 | 2M |
|   | c | What is BYPASS diode?                                 | L1 | 2M |
|   | d | What is central inverter? Draw a diagram.             | L1 | 2M |
|   | e | What is the thermosiphon effect?                      | L1 | 2M |

**PART-B**

(Answer all Five Units 5 x 10 = 50 Marks)

**UNIT-I**

- |   |   |   |    |    |
|---|---|---|----|----|
| 2 | a | Define Conventional and Non-Conventional Energy with Examples.      | L2 | 5M |
|   | b | Outline the merits and demerits of Non-Conventional energy sources. | L1 | 5M |

**OR**

- |   |   |   |    |    |
|---|---|---|----|----|
| 3 | a | What are the types of solar radiation measuring Instruments?  | L2 | 5M |
|   | b | Consider the earth to be a blackbody with average surface temperature 15°C and area equal to $5.1 \times 10^{14} \text{ m}^2$ . Find the rate at which energy is radiated by the earth and the wavelength with that for a 5800 K blackbody (the sun). | L4 | 5M |

**UNIT-II**

- |   |   |  |    |    |
|---|---|--|----|----|
| 4 | a | Explain how solar photovoltaic cell generates electricity in detail.   | L4 | 5M |
|   | b | A solar cell having Fill factor (FF) 68% gives 0.6 V at maximum power point at STC. The cell gives 3 A short circuit current and 0.7 V open circuit voltage. What is the current at maximum power point of the solar cell? | L4 | 5M |

**OR**

- |   |  |    |     |
|---|--|----|-----|
| 5 | What are the different Standard PV module parameters? Discuss all of the parameters. | L2 | 10M |
|---|--|----|-----|

**UNIT-III**

- |   |   |    |     |
|---|---|----|-----|
| 6 | Give the stepwise process of estimating number of PV modules required in series connection and their power calculation. | L2 | 10M |
|---|---|----|-----|

**OR**

- |   |  |    |     |
|---|--|----|-----|
| 7 | Estimate the number of PV modules to be connected together in order to design a solar PV system for power generation with following requirements: Power = 10 kW, Voltage at peak power = 200 V, Current at peak power = 50 A, The PV modules available for this plant are having the following parameters:<br>Vm = 35 V, Im = 8.5 A. Recalculate the numbers. After calculation of number of PV modules, estimate the actual peak power of the system. | L5 | 10M |
|---|--|----|-----|

**UNIT-IV**

- 8 a Describe the working principle of standalone SPV system with only AC/DC load, electronics control circuit and battery. **L3 5M**
- b Describe the working principle of grid connected SPV system with battery storage. **L3 5M**

**OR**

- 9 Find the total number of the PV modules for a factory which contains 1 hp motor (1 hp = 747 W) operating for 4 hours a day, 8 tubelights, each of 50 watts operating for 7 hours a day. Consider a 1 day autonomy for battery. Consider, Inverter Efficiency 93%, system voltage 24 V, Battery DoD = 50%, Battery efficiency = 95%, equivalent daily sunshine hours = 4.5 hours, PV module of 200 Wp. Battery capacity 150 Ah. **L5 10M**

**UNIT-V**

- 10 a Illustrate the functions of various components in flat plate collectors. **L3 5M**
- b What factors affect the performance of solar flat plate collector? **L3 5M**

**OR**

- 11 a What is Storage of chemical heat and the advantages and disadvantages of this heat storage? **L3 5M**
- b Write down the Classification of Storage of chemical heat with the storage materials name. **L3 5M**

**\*\*\*END\*\*\***