

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION SP2023)

CLASS: B.Tech
BRANCH: EEE

SEMESTER : VI
SESSION : SP/2023

SUBJECT: EE365 INTRODUCTION TO SUSTAINABLE ENERGY

TIME: 02 Hours

FULL MARKS: 25

INSTRUCTIONS:

1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates

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|--------|---|-----|-----|-----|
| Q.1(a) | Explain why there a need to harness non-conventional sources of energy? Give two main reasons. | [2] | CO1 | BL2 |
| Q.1(b) | Discuss about the status of conventional and non-conventional energy sources in India, and what are their future prospect? | [3] | CO1 | BL2 |
| Q.2(a) | Describe with proper justification the equivalent circuit of a practical solar PV cell. | [2] | CO2 | BL2 |
| Q.2(b) | Demonstrate the effect of temperature with proper derivation on the PV cell characteristics such as short circuit current, open circuit voltage and peak power. | [3] | CO2 | BL3 |
| Q.3 | A pn junction solar module consisting of 2*10 identical pieces polycrystalline solar cells in series (156 mm * 156 mm), illuminated uniformly with 1000 W/m ² and the temperature of 25°C gives the current of 0.85 A/cell and 0.55 V/cell at maximum power point. The individual cell gives 0.9 A short circuit current and 0.65 V open circuit voltage. The temperature coefficients for short circuit current, open circuit voltage and peak power are +0.045 %/K, -0.34%/K, and -0.47%/K respectively. Evaluate the maximum power that can be drawn from the solar module, fill factor and efficiency of the solar cell at the temperature of 40°C? | [5] | CO2 | BL5 |
| Q.4(a) | Explain why PV is not a voltage source? | [2] | CO2 | BL2 |
| Q.4(b) | Discuss and draw the i-v characteristics along with power curve for two non-identical PV cells connected in parallel without and with protection measures. | [3] | CO2 | BL3 |
| Q.5(a) | Design a PV emulator with the help of switched mode dc-dc converter. | [2] | CO2 | BL6 |
| Q.5(b) | Analyze the operation of dc-dc power interface used for MPPT control of a PV module with suitable sketch and waveforms. | [3] | CO2 | BL4 |

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