

Enrollment No.....



Faculty of Engineering
End Sem (Odd) Examination Dec-2019
OE00061 Solar Energy and its Utilization

Programme: B.Tech.

Branch/Specialisation: All

Duration: 3 Hrs.**Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

- Q.1 i. The average solar radiation received on horizontal surface in India is of the order of (in cal/cm²/day) **1**
 (a) 100-200 (b) 100-350 (c) 400-700 (d) 750-1000
- ii. An instrument used for measuring the intensity of direct solar radiation at normal incidence is known as **1**
 (a) Pyrheliometer (b) Pyranometer
 (c) Pyrgeometer (d) Pyradiometer
- iii. Evacuation of the space between the absorber and the cover plate practically eliminates **1**
 (a) Radiative losses (b) Convective losses
 (c) Conductive losses (d) None of these
- iv. Which of the following is used as thermal storage media? **1**
 (a) Rockpile (b) Glauber's salt
 (c) Eutectic salt (d) All of these
- v. In which semiconductor, fermi energy level lies at exactly the middle of the energy gap **1**
 (a) Extrinsic (b) P type (c) N type (d) Intrinsic
- vi. Outside the earth's atmosphere, the solar energy flux is equal to solar constant i.e. (in W/m²) **1**
 (a) 1454 (b) 1353 (c) 1555 (d) 1223
- vii. Which of the following relation does not contribute to photovoltaic current generation? **1**
 (a) Photons of quantum energy $< E_g$
 (b) Photons of quantum energy $> E_g$
 (c) Photons of quantum energy $= E_g$
 (d) No relation

- viii. For satellites the source of energy is **1**
 (a) Solar cell (b) Cryogenic storage
 (c) Fossil Fuel (d) Edison cell
- ix. Objective of UNFCCC is to stabilize **1**
 (a) CO₂ emission (b) NO₂ emission
 (c) Greenhouse gas emission (d) SO₂ emission
- x. Kyoto Protocol came in existence in year **1**
 (a) 1997 (b) 1995 (c) 1993 (d) 1991
- Q.2 i. Define insolation, diffuse radiation and beam radiation. **3**
 ii. Write the name of the solar radiation measuring instruments. **7**
 Explain any one in detail.
- OR iii. Explain the propagation of solar radiation from the sun to earth through atmosphere. **7**
- Q.3 i. Write a short note on heat transfer mechanism. **3**
 ii. What is the use of solar collector? Explain any one in detail. **7**
- OR iii. Explain the solar thermal power system in detail. **7**
- Q.4 i. What is meant by solar cell? Write down its applications. **3**
 ii. Explain the photovoltaic principle. Also discuss the advantages and disadvantages of PV cell. **7**
- OR iii. Name the types of solar cells which are mostly used. Describe any one in detail. **7**
- Q.5 i. Write down the comparison between on grid and off grid solar power system. **3**
 ii. Describe a basic photovoltaic system for power generation. **7**
- OR iii. Explain the solar cell module in detail. **7**
- Q.6 i. How does the carbon trade work? **3**
 ii. Evaluate the carbon credit of solar energy system. **7**
- OR iii. Analyse the life cycle and environmental impacts of solar energy system. **7**

P.T.O.

Marking Scheme

OE00061 Solar Energy and its Utilization

| | | | |
|-----|-------|--|---|
| Q.1 | i. | The average solar radiation received on horizontal surface in India is of the order of (in cal/cm ² /day) | 1 |
| | | (c) 400-700 | |
| | ii. | An instrument used for measuring the intensity of direct solar radiation at normal incidence is known as | 1 |
| | | (a) Pyrheliometer | |
| | iii. | Evacuation of the space between the absorber and the cover plate practically eliminates | 1 |
| | | (b) Convective losses | |
| | iv. | Which of the following is used as thermal storage media? | 1 |
| | | (d) All of these | |
| | v. | In which semiconductor, fermi energy level lies at exactly the middle of the energy gap | 1 |
| | | (d) Intrinsic | |
| | vi. | Outside the earth's atmosphere, the solar energy flux is equal to solar constant i.e. (in W/m ²) | 1 |
| | | (b) 1353 | |
| | vii. | Which of the following relation does not contribute to photovoltaic current generation? | 1 |
| | | (a) Photons of quantum energy < E _g | |
| | viii. | For satellites the source of energy is | 1 |
| | | (a) Solar cell | |
| | ix. | Objective of UNFCCC is to stabilize | 1 |
| | | (c) Greenhouse gas emission | |
| | x. | Kyoto Protocol came in existence in year | 1 |
| | | (a) 1997 | |

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|-----|------|---|---------|
| Q.2 | i. | Definition of insolation, diffuse radiation and beam radiation | 3 |
| | | 1 mark for each (1 mark * 3) | |
| | ii. | Name of instruments | 1 mark |
| | | Diagram | 2 marks |
| | | Which radiation it measures | 1 mark |
| OR | | Working | 3 marks |
| | iii. | Propagation of solar radiation from the sun to earth through atmosphere | 7 |
| | | Diagram with clear labelling | 4 marks |
| | | Theory | 3 marks |
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| Q.3 | i. | Heat transfer mechanism. | 3 |
| | | Conduction | 1 mark |

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|-----|------|--|--------------|---|
| | | Convention | 1 mark | |
| | | Radiation | 1 mark | |
| | ii. | Use of solar collector | 2 marks | 7 |
| | | Name of different collectors | 1 mark | |
| | | Solar collector diagram | 2 marks | |
| | | Working | 2 marks | |
| OR | iii. | Solar thermal power system | | 7 |
| | | Block diagram | 3 marks | |
| | | Working | 4 marks | |
| Q.4 | i. | Solar cell | 1 mark | 3 |
| | | Its applications | 2 marks | |
| | ii. | Photovoltaic principle | 2 marks | 7 |
| | | Diagram | 1 mark | |
| | | Energy band diagram | 2 marks | |
| | | Advantages of PV cell | 1 mark | |
| | | Disadvantages of PV cell | 1 mark | |
| OR | iii. | Types of solar cells | 2 marks | 7 |
| | | Material | 1 mark | |
| | | Diagram | 2 marks | |
| | | Working | 2 marks | |
| Q.5 | i. | Comparison b/w on grid and off grid solar power system | | 3 |
| | | At least 3 comparison 1 mark for each | (1 mark * 3) | |
| | ii. | Basic photovoltaic system for power generation | | 7 |
| | | Diagram | 3 marks | |
| | | Working | 4 marks | |
| OR | iii. | Solar cell arrangement | 2 marks | 7 |
| | | Design classes theory | 2 marks | |
| | | Working | 3 marks | |

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|-----|------|--|-----------|----------|
| Q.6 | i. | Carbon trade work | | 3 |
| | ii. | Carbon credit of solar energy system. | | 7 |
| | | Definition | 2 marks | |
| | | International framework | 2 marks | |
| | | Evaluation | 3 marks | |
| OR | iii. | Life cycle of solar energy system | 3.5 marks | 7 |
| | | Environmental impacts of solar energy system | 3.5 marks | |
