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INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech VI Semester End Examinations (Regular) - May, 2019

Regulation: IARE – R16

SOLAR ENERGY SYSTEMS

Time: 3 Hours

(ME)

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT – I

1. (a) What are the basic properties of a black body? Formulate an expression for Einstein's blackbody radiation. [7M]
- (b) Calculate the total irradiation from a surface if its spectral distribution is as in Figure 1. [7M]

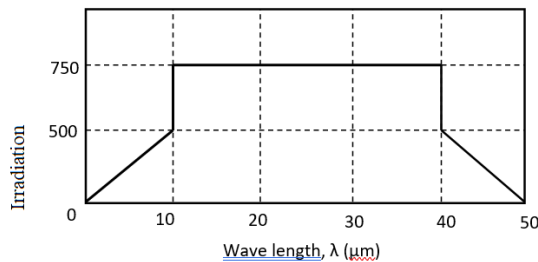


Figure 1

2. (a) Summarize various approaches of utilization of solar energy, merits, demerits and applications. [7M]
- (b) Calculate the number of daylight hours at Bangalore on 21 June and 21 December in a leap year. The latitude of Bangalore is $12^{\circ} 58'N$. [7M]

UNIT – II

3. (a) Define solar constant. How measurement of solar constant. what are different ways to measure solar constant. [7M]
- (b) Estimate the ratio of beam radiation on a surface tilted 45° toward the south to that on a horizontal surface, if located at a latitude of 40° on March 1, at noon and at 3:30 pm. [7M]
4. (a) Differentiate between direct sunlight and scattered sunlight. [7M]
- (b) A space heating system is to be designed for Srinagar $\varphi=34^{\circ} 05'$, for the month of December. Calculate the Degree days and the space heating load, if $(UA)h = 400 \text{ W}/^{\circ}C$. [7M]

UNIT – III

5. (a) What is meant by intrinsic and extrinsic semiconductors? Explain with neat sketch. [7M]
(b) For a silicon solar cell with $m=12.7$ and $n=1.14$, find the fill factor. [7M]
6. (a) Explain the properties of solar material and design of solar cell with a neat sketch. [7M]
(b) Find m and n when current density at $0.441V$ is 63.0 mAcm^{-2} and at $0.405V$ is 54.9 mAcm^{-2} . Assume the open circuit voltage and short circuit current density to be constant at 0.9 V and 1.5 mAcm^{-2} . [7M]

UNIT – IV

7. (a) Explain the working of a solar air dryer for crop drying with a neat sketch. [7M]
(b) Explain about solar thermal power plant, with a neat sketch, discuss the thermal efficiency of the plant. [7M]
8. (a) Illustrate the photovoltaic applications battery charger with a neat sketch. [7M]
(b) Explain the need, types and constructional details of solar thermal energy storage system. [7M]

UNIT – V

9. (a) Enumerate the principle of packed bed solar energy storage system. [7M]
(b) Compare lead acid and nickel cadmium batteries. Discuss lead acid or nickel cadmium batteries are better. [7M]
10. (a) Design a battery charger circuit with a circuit diagram and write down steps involved in how charging occurs. [7M]
(b) Summarize necessity of storage of solar energy, specify merits, demerits and applications in detail. [7M]

