D **188B2** **Total pages: 2**

Register No: …… Name: .....

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

EIGHTH SEMESTER B.TECH DEGREE EXAMINATION(R), MAY 2024

Electrical and Electronics Engineering

(2020 SCHEME)

Course Code : 20EET456

Course Name : Solar PV Systems

Max. Marks : 100 **Duration:3 Hours**

Scientific calculator and statistical table is allowed in the examination hall.

PART A

(Answer all questions. Each question carries 3 marks)

1. Explain the following terms related to a tilted solar collector surface (i) Slope, (ii) Surface azimuth angle, (iii) Angle of incidence.
2. Differentiate between albedo radiation and global radiation.
3. List any three advantages of a solar furnace.
4. Explain acceptance angle and concentration ratio of a solar concentrating collector.
5. Describe the principle of operation of a solar cell.
6. Elucidate the need for maximum power point tracking in solar photovoltaic modules.
7. State the important issues that a grid interactive inverter has to address.
8. Explain the design methodology of solar photovoltaic systems.
9. What are the major components of lifecycle costing (LCC)?
10. State the reasons for reverse power flow when a photovoltaic inverter is connected to the grid.

PART B

(Answer one full question from each module, each question carries 14 marks)

MODULE I

11. (a) Describe the sun as a source of energy. 7
    (b) Describe the significance of: (i) Solar constant, (ii) Air mass, (iii) Solar time. 7

OR

12. (a) Obtain the angle between beam and collector for a horizontal surface. 4
    (b) Determine the angle of incidence in Mumbai at solar noon on 1st November on the horizontal plane. Assume that the latitude is 19.12 degrees. 10

MODULE II

13. With neat sketches, describe the two schemes for passive solar heating of energy efficient buildings. 14

OR

14. On the basis of the energy balance equations, derive the instantaneous collector efficiency for a liquid flat plate collector. 14

MODULE III

15.	(a) Elucidate the detrimental effects of shadowing on a string of series connected cells. (b) Describe how the effects of shadowing can be avoided. Justify your answer with the help of neat figures.	7 7
	OR	
16.	Describe the characteristic features of the following types of photovoltaic (PV) modules: (i) Single-crystal solar cell module, (ii) Thin-film PV module, and (iii) III-V single junction and multijunction PV modules.	14
	MODULE IV	
17.	With the help of a neat block diagram, describe the operation of a grid interactive inverter.	14
	OR	
18.	Differentiate between stand-alone and grid-connected photovoltaic systems with the help of neat diagrams.	14
	MODULE V	
19.	Describe the measures for overcurrent protection in solar photovoltaic power systems.	14
	OR	
20.	Describe the design steps for sizing fuses for photovoltaic systems as per the National Electrical Code.	14

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