

Reg. No. : 

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**Question Paper Code : 51108**

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2023.

Fifth Semester

Civil Engineering

ORO 551 — RENEWABLE ENERGY SOURCES

(Common to : Aeronautical Engineering/Aerospace Engineering/  
Agriculture Engineering/ Automobile Engineering/Biomedical Engineering/  
Electronics and Communication Engineering/ Electronics and Telecommunication  
Engineering/Environmental Engineering/Industrial Engineering/Industrial  
Engineering and Management/Manufacturing Engineering/Marine  
Engineering/Material Science and Engineering/Mechanical Engineering/ Medical  
Electronics/Petrochemical Engineering/Production Engineering/Safety and Fire  
Engineering/Bio Technology/Chemical Engineering/Chemical and Electrochemical  
Engineering/Fashion Technology/Food Technology/Handloom and Textile  
Technology/Petrochemical Technology/ Petroleum Engineering/ Pharmaceutical  
Technology/Textile Chemistry/Textile Technology)

(Regulations 2017)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is Solar time?
2. Name the instruments used to measure the Solar Radiation and Sunshine hours.
3. Name three collectors requiring one axis sun-tracking.
4. Define concentration ratio of solar collectors.
5. Give some applications of solar energy storage systems.
6. What is the principle of solar PV energy conversion?
7. Compare the horizontal and vertical axis wind turbines.

8. List few biomass energy resources.
9. What is geothermal energy?
10. What are the main hurdles in the development of tidal energy?

PART B — (5 × 13 = 65 marks)

11. (a) (i) Discuss the potential of renewable energy. (7)
- (ii) Explain the environmental impacts of solar power. (6)

Or

- (b) With necessary diagram, explain in detail the propagation of solar radiation in terms of terrestrial and extraterrestrial radiations. (13)
12. (a) Explain concentrating type solar collectors and mention their advantages and disadvantages over flat plate collectors. (13)

Or

- (b) (i) Discuss the various performance parameters of solar collectors. (6)
- (ii) Discuss the choice of materials for various parts of flat plate collector. (7)
13. (a) With the help of block diagram, explain the working of solar pond electric power plant.

Or

- (b) Explain sensible heat thermal energy storage system with suitable diagram.
14. (a) Explain the construction and working of horizontal axis wind turbine and plot the power characteristic.

Or

- (b) Explain the operation of bio gas plant and discuss combustion characteristics.
15. (a) Explain the technologies available for OTEC plant.

Or

- (b) Explain the direct energy conversion methods in detail.

PART C — (1 × 15 = 15 marks)

16. (a) Develop the thermal resistance network of a flat plate collector and analyze the various thermal losses that occur in the collector.

Or

- (b) An inclined surface facing due south is tilted at 60 deg with horizontal. It's location is at Aligarh (latitude 27°54' N, longitude 78°04' E) on March 22 at 1 PM (IST). The reflection coefficient of the ground is 0.2. Calculate the total radiation received at the surface. Also calculate the values of  $R_b$ ,  $R_d$  and  $R_r$ .