

**VIT**

Vellore Institute of Technology

Final Assessment Test – November 2019

Course: MEE1011 - Renewable Energy Sources

Class NBR(s): 1110

Time: Three Hours

Slot: A1+TA1+V1

Max. Marks: 100

KEEPING MOBILE PHONE/SMART WATCH, EVEN IN 'OFF' POSITION, IS EXAM MALPRACTICE**General Instructions:**

- Give sketches wherever needed to enhance presentation, whether specifically asked or not.
- Attested Solar Energy Technologies Data Sheet may be permitted.

SEARCH VIT QUESTION PAPERS
ON TELEGRAM TO JOIN**PART – A (16 Marks)****Answer the Question**

- A Minister is kidnapped in India and the kidnappers collected his cell phone and kept in a secret place. He has a watch showing date and time. The date is May 25th. To identify his location, he observed the minimum length of his shadow on flat ground as 0.16 m at 12:10 P.M. His actual height is 1.55 m. He used compass and protractor to observe his shadow angle with south and found as 14° at the instant of minimum shadow. Investigate his location using solar geometry.

PART – B (7 X 12 = 84 Marks)**Answer any SEVEN Questions**

- Explain briefly with neat sketches how can renewable energy help climate change and can it replace fossil fuels fully in our society.
- Design and calculate the overall loss coefficient for a flat plate collector with two glass covers. Given the following data:
Size of the absorber plate: 2.1 m X 0.8 m; Spacing between plate and first glass cover: 4.3 cm; Spacing between first and second glass cover: 4.3 cm; Plate emissivity: 0.94; Glass cover emissivity: 0.87; Collector tilt angle: 24°; Mean plate temperature: 72°C; Ambient air temperature: 25°C; Wind speed: 2.4 m/s; Back insulation thickness: 7 cm; Side insulation thickness: 3 cm; Thermal conductivity of insulation: 0.06 W/m-K. Assume any suitable data wherever necessary.
- Construct and calculate the performance of a conventional solar air heater with the following data:
Length of collector: 2.5 m; Width of collector: 1.5 m; Length of absorber plate: 1.9 m; Width of the absorber plate: 0.9 m; Spacing between absorber plate and bottom plate: 1.8 cm; Air flow rate: 250 kg/h; Air inlet temperature: 55°C; Ambient temperature: 23°C; Solar flux incident on the collector face: 980 W/m²; $(\tau\alpha)_{av}=0.88$; Top loss coefficient: 6.2 W/m²K; Bottom loss coefficient: 0.78 W/m²K; $\epsilon_p=\epsilon_b$.
- A cooler (150 W), a refrigerator (140W), 3 CFLs bulb (8 W each), a TV (52W), and 3 Fans (45W each) for 6hrs per day. Battery voltage=14V. Battery capacity=130Ah. Sun light available in a day=8hr/day (equivalent of peak radiation). PV panel power rating=47Wp (watt peak capacity). Battery charging and discharging cycle efficiency is about 93%. Depth of discharge is 84%. 0.79 is the operating factor. Assume days of autonomy is one. Determine (a) the total energy requirement of the system (b) the number of PV panels required (c) the battery requirement (d) size of the inverter and (e) estimate the cost of the full system.
- What is biogas? What are the factors affecting the biogas generation? Briefly explain about conventional biogas plants in India with neat sketches.
- How does wind energy work? Explain about offshore wind farms and also explain about the solar wind hybrid energy system with neat sketches.
- Why small hydro power is important? Briefly explain the schemes available in small hydro power plant in India.
- What is geothermal energy and how it works? Briefly explain about the generation of geothermal energy and production of electricity through geothermal energy.