

**B.Tech. DEGREE EXAMINATION, NOVEMBER 2018**  
3<sup>rd</sup> to 7<sup>th</sup> Semester

**15EE251E - SUSTAINABLE ENERGY**

(For the candidates admitted during the academic year 2015 - 2016 to 2017-2018)

**Note:**

- (i) **Part - A** should be answered in OMR sheet within first 45 minutes and OMR sheet should be handed over to hall invigilator at the end of 45<sup>th</sup> minute.
- (ii) **Part - B** and **Part - C** should be answered in answer booklet.

Time: Three Hours

Max. Marks: 100

**PART - A (20 × 1 = 20 Marks)**

Answer ALL Questions

1. The hour angle is equivalent to \_\_\_\_\_  
(A) 10° per hour (B) 15° per hour  
(C) 20° per hour (D) 25° per hour
2. The angle made by the plane surface with the horizontal is known as \_\_\_\_\_  
(A) Latitude angle (B) Slope angle  
(C) Surface azimuth angle (D) Declination
3. \_\_\_\_\_ is one of the most important materials used in the solar grade silicon.  
(A) Crushed silicon (B) Crystalline silicon  
(C) Powered silicon (D) Silicon
4. The efficiency of solar cells is about \_\_\_\_\_  
(A) 25% (B) 15%  
(C) 40% (D) 60%
5. Winds having following speed are suitable to operate wind turbines  
(A) 5-25 m/s (B) 10-35 m/s  
(C) 20-45 m/s (D) 30-55 m/s
6. The wind speed is measured using an instrument called \_\_\_\_\_  
(A) Pyranometer (B) Wind vane  
(C) Anemometer (D) Manometer
7. Which of these is not a part of a modern wind turbine?  
(A) Compressor (B) Gear box  
(C) Nacelle (D) Yaw drive
8. Theoretical maximum efficiency of wind power is about \_\_\_\_\_  
(A) 30% (B) 48%  
(C) 59% (D) 65%

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9. The term biomass most often refers to \_\_\_\_\_  
 (A) Inorganic matter (B) Organic matter  
 (C) Chemicals (D) Ammonium compounds
10. \_\_\_\_\_ is called as the bio gas.  
 (A) Bio ethanol (B) Bio methane  
 (C) Bio diesel (D) Bio butanol
11. \_\_\_\_\_ is an irreversible chemical change caused by the action of heat in absence of oxygen.  
 (A) Pyrolysis (B) Combustion  
 (C) Anaerobic digestion (D) Gasification
12. The composition of carbondioxide in biogas is  
 (A) 50-60% (B) 30-45%  
 (C) 5-10% (D) 1-2%
13. Which is the type of energy where the energy is harnessed by the heat accumulated on the surface of water?  
 (A) Wind energy (B) Wave energy  
 (C) Tidal energy (D) Ocean thermal energy conversion
14. The claude cycle is also called as \_\_\_\_\_  
 (A) Open cycle (B) Closed cycle  
 (C) Anderson cycle (D) Hybrid cycle
15. Difference between water height at high tide and water height at low tide is called  
 (A) Tidal variation (B) Tidal volume  
 (C) Tidal range (D) Tidal current
16. Water to the turbine is allowed through the \_\_\_\_\_  
 (A) Pipes (B) Sluice gates  
 (C) Canals (D) Pumps
17. What is hot molten rock called?  
 (A) Lava (B) Magma  
 (C) Igneous rocks (D) Volcano
18. The hole on earth's surface form where the steam from the earth comes out is called as  
 (A) Gash (B) Mud pot  
 (C) Void (D) Fumarole
19. Which kind of geothermal plant is most common type?  
 (A) Dry steam (B) Flash  
 (C) Binary (D) Wet steam
20. How much is the average temperature at depth of 10 KM of earth surface?  
 (A) 200°C (B) 900 °C  
 (C) 650°C (D) 20°C

**PART - B (5 × 4 = 20 Marks)**

Answer ANY FIVE Questions

21. What are the prospects of non-conventional energy sources in India?
22. Explain briefly the Trombe wall solar space heating system.
23. How are wind energy conversion systems classified? Discuss in brief.
24. Derive the expression for power developed due to wind.
25. List out any four factors which affect the size of the biogas plant.
26. State why closed cycle OTEC is preferred?
27. Draw the T-S diagram of a liquid dominated geothermal power plant and explain.

**PART - C (5 × 12 = 60 Marks)**

Answer ALL Questions

28. a. With the help of a neat sketch, describe a solar active water heating system.

(OR)

- b.i. What is the significance of 22<sup>nd</sup> June and 22<sup>nd</sup> December with reference to solar rays and angle of declination. (4 Marks)

- ii. Describe in detail about the standalone photo voltaic power plant with necessary diagram. (8 Marks)

29. a. Prove that the maximum power obtained is  $\frac{8}{27} \rho A V^3$  for horizontal axis wind turbine.

(OR)

- b. Discuss the main considerations in selecting a site for wind generators.

30. a. Explain the constructional details and working of KVIC digester.

(OR)

- b. Discuss in detail the anaerobic digestion process. Explain the parameters to be controlled to achieve the biogas production efficiently.

31. a. Explain the double basin tidal power generation in detail.

(OR)

- b. Discuss in detail the Dolphin-type wave power machine.

32. a. Explain the schematic and thermodynamic cycle of any one type of geothermal power plant.

(OR)

- b.i. State the types of geothermal fluid and their temperature range.

- ii. Explain the difference between a geothermal power plant and a thermal power plant.

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