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Question Paper Code: R9372

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2025

Open Elective

R21UEE972 – RENEWABLE ENERGY TECHNOLOGY

(Regulations R2021)

(Common to All Engineering Branches)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. The largest share of world energy consumption comes from: CO1- U
(a) Renewable energy (b) Nuclear energy (c) Fossil fuels (d) Hydropower
2. Which country has the largest proven coal reserves? CO2- App
(a) USA (b) China (c) India (d) Russia
3. The device used to capture solar energy in a flat plate solar collector is CO1- U
mainly made of
(a) Transparent glass cover (b) Reflective mirror
(c) Blackened absorber plate (d) Aluminum foil
4. Concentrating collectors differ from flat plate collectors because they CO1- U
(a) Collect both solar and wind energy (b) Focus solar radiation on a small area
(c) Work only at night (d) Use photovoltaic cells
5. The parameter commonly used to describe wind data at a site is CO1- U
(a) Wind velocity profile (b) Turbulence intensity
(c) Wind power density (d) Wind shear coefficient
6. The average power in the wind is proportional to CO1- U
(a) Square of wind speed (b) Cube of wind speed
(c) Fourth power of wind speed (d) Inverse of wind speed

7. The simplest method of converting biomass into energy is CO1- U
 (a) Pyrolysis (b) Gasification (c) Direct combustion (d) Anaerobic digestion
8. The biogas produced in a biogas plant mainly consists of CO1- U
 (a) Methane and carbon dioxide (b) Hydrogen and oxygen
 (c) Nitrogen and ammonia (d) Ethanol and CO₂
9. The main source of tidal energy is CO1-U
 (a) Earth's rotation (b) Gravitational pull of moon and sun
 (c) Ocean temperature difference (d) Wind over sea surface
10. Wave energy is primarily generated due to CO1- U
 (a) Solar heating of oceans (b) Movement of tectonic plates
 (c) Wind blowing over the sea surface (d) Magnetic field variations

PART – B (5 x 2= 10 Marks)

11. Define world energy use. Mention two factors influencing the growth of global energy demand CO1- U
12. Calculate the solar energy incident on a 2 m² flat plate collector receiving an average solar radiation of 800 W/m² for 1 hour. CO2- App
13. A wind turbine with rotor area 40 m² operates at a wind speed of 8 m/s. Calculate the power available in the wind (air density = 1.2 kg/m³). CO3- App
14. Compare the efficiency of biomass direct combustion and biomass gasification systems. CO4- Ana
15. Compare tidal energy and wave energy with respect to their availability and environmental impact. CO5- Ana

PART – C (5 x 16= 80 Marks)

16. (a) Discuss the Importance of Non-Conventional energy sources, Energy chain and Consumption trend of Primary Energy Resources. CO1- U (16)
- Or
- (b) Explain the Environmental aspects of Energy Conservation with a neat sketch. CO1- U (16)

17. (a) Calculate the capacity of a solar PV system required to supply a daily load of 12 kWh for a rural household. Justify the assumptions made. CO2 - App (16)
- Or
- (b) Predict the performance of a flat plate collector and a concentrating collector when used for industrial process heating. Which one would you recommend and why? CO2 - App (16)
18. (a) Illustrate the procedure to analyze wind data using a Weibull distribution to determine the mean wind power density at a site. CO1- U (16)
- Or
- (b) Demonstrate the working principle of horizontal-axis and vertical-axis wind turbines and use suitable examples to highlight their applications. CO1- U (16)
19. (a) Analyze the working of a biomass direct combustion system and discuss its efficiency compared to other biomass conversion processes. CO4-Ana (16)
- Or
- (b) Examine the performance of a biomass gasifier when used for electricity generation in rural applications, highlighting its advantages and limitations. CO4-Ana (16)
20. (a) Classify the various renewable energy sources such as tidal, wave, OTEC, hydro, geothermal, and fuel cells based on their mode of energy conversion, and discuss their comparative efficiencies. CO5-Ana (16)
- Or
- (b) Break down the working principles of open-cycle and closed-cycle OTEC systems and analyze their feasibility for large-scale power generation in tropical regions. CO5-Ana (16)

