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Question Paper Code : 57530

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2016

Sixth Semester

Mechanical Engineering

ME 6003 – RENEWABLE SOURCES OF ENERGY

(Regulations 2013)

Time : Three Hours

Maximum : 100 Marks

Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

1. Define : Exhaustible Renewable Energy and Inexhaustible Renewable Energy Sources.
2. What do you understand by 'Carbon Neutral Technology' ?
3. Define : 'Doping' in SPV.
4. What do 'Pyranometer' and 'Pyrheliometer' measure ?
5. State the function of 'Yaw' in a Wind Mill.
6. Define Betz Coefficient and indicate its value.
7. State the typical composition of 'Producer Gas' and its Calorific Value.
8. Cogeneration refers to simultaneous Heat & Power Generation. True or False. Justify.
9. Name 4 advantages of usage of H₂ as a fuel.
10. Give 2 examples for Renewable Energy based Hybrid Systems that are in operation commercially.

PART – B (5 × 16 = 80 marks)

11. (a) (i) List the Renewable Energy Power Sources tapped in India for power generation and their contribution in MW to the National Energy Basket. . (5)
- (ii) Discuss the importance of Renewable Energy Sources usage in the context of global warming. (6)
- (iii) Brief the Demerits/Limitations of Renewable Energy Sources. (5)

OR

- (b) (i) Discuss the merits/demerits of Renewable Energy sources that are relevant in India. (6)
- (ii) Write on Green Power and Greenhouse Gas. (6)
- (iii) Write on the economics of a Solar & a Wind Energy System in terms of Simple Payback Period. (4)
12. (a) (i) Discuss the factors that affect the performance of a Solar Flat Plate Collector. (8)
- (ii) List the components of a Solar PV System integrated with a Power Grid and explain. (8)

OR

- (b) (i) Write the principle of operation of a Solar Tower & Solar Pond with a simple sketch. (8)
- (ii) Differentiate Active and Passive Solar Heating System. (5)
- (iii) Establish the conversion efficiency of a 175 W Solar Panel (size : 750 mm × 1500 mm) for a solar insolation of 1180 W/m². (3)
13. (a) (i) Derive an expression for estimating energy available in Wind. (5)
- (ii) Make a technical comparison between Horizontal and Vertical Axis Wind Turbines. (5)
- (iii) A Wind Mill generates 2 MW Power (Conditions : Speed 25 kmph, Temp. 25°C, Atm Pr.). Calculate the change in the Power output for the altered conditions of Speed = 30 kmph, Pr. = 0.9 atm, T = 20°C and Altitude = 1800 m. (6)

OR

- (b) (i) Define the CoP of a Wind Mill and mention the theoretical value for it. (4)
- (ii) Write a technical note on “Off shore Wind Energy” and also indicate the necessity for it. (6)
- (iii) Comment on the Environmental Impact of Wind Energy. (6)

14. (a) (i) Write the governing equations for combustion, gasification, pyrolysis and Biomethanation and brief. (10)
- (ii) Explain with a neat sketch the production process of Biogas indicating its composition & calorific value. (6)

OR

- (b) (i) Write notes on Energy Plantation & Ethanol Production from Sugarcane. (8)
- (ii) List out 3 types of Gasifiers and write about any 2 in detail indicating working principle, merits and limitations. (8)

15. (a) (i) List the merits and disadvantages of a Geothermal Energy Extraction Process. (6)
- (ii) Differentiate technically the Tidal Energy and Wave Energy. (5)
- (iii) Explain the working principle of a OTEC System and show that its overall efficiency is quite low. [Hint : Use Carnot Cycle η assuming suitable T_1 and T_2] (5)

OR

- (b) (i) Write a note on the ‘Classification of Fuel Cells’. (6)
- (ii) Discuss the Demerits of Hydroelectric Power Plants. (4)
- (iii) Write a short note on : Claude Cycle System (OTEC) and H_2 Storage. (6)