SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY :: PUTTUR
(AUTONOMOUS)
(Approved by AICTE, New Delhi & Affiliated to JNTUA, Anantapuramu)
(Accredited by NBA & Accredited by NAAC with 'A' Grade)
(An ISO 9001:2008 Certified Institution)
Siddharth Nagar, Narayanavanam Road, PUTTUR-517 583

QUESTION BANK

Subject with Code: AES (16ME8814) **Course & Branch: M. Tech(TE)**
Sem : II-Sem **Regulation: R16**

UNIT-1

1 (a) Define solar constant. Write brief notes on 'Diffuse radiation'.

(b) List out different types of concentrating solar collectors. Why orientation is needed in concentrating type collectors?

2 (a) What are the wind energy characteristics?

(b) Enumerate different wind energy conversion systems. Explain function of one in detail.

3 Derive an expression for instantaneous efficiency for a solar flat plate collector.

4 (a) Distinguish between vertical axis and horizontal axis wind turbines.

(b) Draw and explain the typical performance curves of wind machines.

5 (a) Define the following terms: (i) Beam radiation and diffuse radiation. (ii) Surface azimuth angle and solar azimuth angle. (iii) Local clock time and local apparent time.

(b) Discuss the energy balance equation and flat plate collector efficiency. How can the efficiency of the flat plate collector be determined?

6 (a) Discuss the different types of wind turbines used to extract wind energy.

(b) Derive an expression for energy that can be extracted from wind.

7.Determine the heat removal factor for a collector with serpentine tube having the following specifications. Length of one serpentine segment, L = 1.2 m, distance between tubes, W = 0.1 m,

number of segments, N = 6, plate thickness, tube outside diameter, D = 7.5 mm, tube inside diameter, Di = 6.5 mm, plate thermal conductivity, k = 211 W/mK, overall loss coefficient , UI = 5 W/m2K, fluid mass flow rate, = 0.014 kg/s, fluid specific heat, Cp = 3352 J/kgK, fluid-totube heat transfer coefficient hfi = 1500 W/m2K, bond conductance Cb = ∞.

8 (a) Prove that the maximum turbine output can be achieved when .

(b) Derive an expression for energy that can be extracted from wind.

9(a) Give your justification on the statement 'solar cooling is more effective than the solar heating'.

(b) Calculate the average value of solar radiation on a horizontal surface for June 19, at the latitude of 10 N. The constants 'a' and 'b' are as 0.30 and 0.51 respectively. The average sunshine hours per day are 9.1. Monthly average of the daily extra terrestrial radiation, which would fall a horizontal surface at the location under consideration (kJ/m2-day) is:

10 (a) Wind at one standard atmospheric pressure and 15 has a speed of 10 m/s. A 10 m diameter wind turbine is operating at 5 rpm with maximum efficiency of 40%. Calculate: (i) The total power density in wind stream. (ii) The maximum power density. (iii) The actual power density. (iv) The power output of the turbine and (v) The axial thrust on the turbine structure.

(b) What is the Betz limit?

UNIT-2

1 (a) Classify Geothermal energy sources. Name various types of systems to use geothermal energy.

(b) Describe the closed cycle OTEC system with its advantages over open cycle system.

2 (a) What is the basic principle of ocean power conversion?

(b) Describe the closed cycle OTEC system with its advantages over open cycle.

3 (a) Explain with relevant sketches and T-s working of a liquid dominated double flash steam system.

(b) What are the prospects of geothermal energy in India and across the globe?

4 (a) Explain with a simple sketch, construction and working of double basin tidal power plant.

(b) What are wave energy conversion devices, explain with a simple sketch, working of high level reservoir wave machine?

5 (a) Describe with examples and diagrams the following geothermal resources natural hydrothermal reservoirs, geo-pressured reservoirs, hot dry rock and ultra-low-grade systems.

(b) Describe the working of the following geothermal stations dry steam power plant and binary power plants.

6 (a) Distinguish between a 'Tidal Power Plant' and an OTEC plant with particular reference to:

(i) An Anderson closed cycle OTEC plant. (ii) A 'Two pool tidal' power plant. (iii) A 'modulate' single pool tidal system.

(b) What is meant by 'Tidal range' R?

7 (a) What is meant by mantle?

(b) Suggest a suitable power plant technology to geothermal sources and explain in detail.

8 (a) What is the current status of tidal power developments in India?

(b) For Rann of Kutch the basin area of a tidal project is 0.72 sq. km with a difference of 6 m between the high and low water levels. The average available head is 5 m and the system generates electric power for 4 hours in each cycle. Assuming the overall efficiency as 80%, calculate the power in kW at any point of time and the yearly power output. Density of sea water is 1025 kg/m3.

9 (a) Elaborate about the global status of electricity generation for geothermal resources.

(b) What is the current status of geothermal energy in India?

10 (a) Explain Carnot efficiency of an OTEC plant with the help of a thermodynamic cycle on T-s plane. (b) A single basin type tidal power plant has a basin area of 22 km2. The tide has a range of 10 m. The turbine stops operation when the head on it falls below 3 m. Calculate the average power generated during one filling/emptying process in MW, if the turbine generator efficiency is 74%. Take specific gravity of sea water as 1.025.

UNIT-3

1 Explain the process of Hydrogen fuel production by its advantages over open cycle.

2 Explain with a simple sketch, production of hydrogen by thermal decomposition of water.

3 (a) Describe how hydrogen produced form organic material by the process of electrolysis.

(b) Explain the storage of hydrogen by the following methods: (i) Compressed hydrogen. (ii) Liquefied hydrogen. (iii) Solid hydrogen.

(c) Why is hydrogen not a feasible energy source? Discuss safety, storage and production issues

4 Brief about the hydrogen storage using nano-crystalline Mg-based Ni-hydride.

5 Write about the natural gas reforming for hydrogen production.

6 (a) Explain storage of hydrogen.

(b) Explain process of using hydrogen as fuel for vehicles.

7 (a) Enumerate various applications of hydrogen.

(b) Discuss about storage of hydrogen.

8 (a) Describe various methods of hydrogen fuel for vehicles.

(b) What are the advantages and limitations of hydrogen as fuel in transportation sector?

9 How to produce hydrogen from sunflower oil? What are limitations

10 Analyze the cost in hydrogen production using various methods.

UNIT-4

1. Classify fuel cell. Write brief notes on working principle of each type.
2. Explain the basic theory of electrochemistry applied to fuel cells.
3. (a) What is thermal efficiency of a fuel cell? (b) In connection with a fuel cell, explain the meaning of and use this for an isothermal thermodynamic all gas chemical reaction in a fuel cell to find an expression for the maximum value of internal cell voltage and the conversion efficiency.
4. (a) What are various types of fuel cells? (b) Explain construction and function of fuel cell.
5. (a) What is the principle of fuel cell? (b) Describe performance characteristics of fuel cell.
6. What are fuel cells? Explain with simple sketch working of molten carbonate fuel cell.
7. (a)Enumerate applications of fuel cells.
   (b) List out the advantages and limitations of fuel cell.
8. Discuss and differentiate between “Electrical efficiency” and “Thermal efficiency” of the fuel cell.
9. Discuss the performance characteristics and applications of fuel cell.
10. Find the maximum possible value of the internally generated voltage of the hydrogen-oxygen cell at STP where the product is in its liquid state. Find also the internally generated voltage of the hydrogen-oxygen cell at temperature of 32 when the air is used as the oxidant and the product is water. The air is supplied a pressure of 1.2 atmosphere and the hydrogen is at a pressure of 1.1 atmosphere. The partial pressure of oxygen in air is 0.21, Gibbs free energy at STP for water for water is 237 x 106 coulomb, for H+ = 0.

UNIT-5

1 (a) "Hydropower is main power generating source". Discuss.

(b) Explain function of each component in Hyderabad Power Plant.

2 (a) Explain process of harnessing nuclear energy.

(b) What are the challenges in nuclear power generation?

3 Draw and explain with typical sketch, construction and working of a micro hydel power plant.

4 (a) What are breeder reactors? Explain with suitable sequential reactions the process of breeding in a reactor.

(b) What are nuclear wastes and how are they handled in a nuclear reactor?

5 (a) Describe the major components required for the high/medium head hydro-power projects.

(b) Explain the working of a low-head small hydro project on a canal.

6 (a) Explain the methods of Uranium enrichment. Describe the limitations of each of the methods.

(b) Describe different types of nuclear reactors used for power generation. Draw schematic diagrams to explain the functioning of any one of these reactors.

7 Draw the arrangement of high/medium head design of small hydro power project and explain about the major components.

8 What is a CANDU-type reactor? Explain with a sketch its main features. What is a calandria?

9 Write about the main features of a micro hydroelectric project installed at India.

10 (a) What is thermal reactor? What is a fast reactor?

(b) Draw a neat sketch of a gas cooled nuclear reactor and explain its construction and working.