

QUESTION BANK

UNIT-I

- 1.a) What is beam and diffused radiation? (JNTU/May 2013)
b) Define and explain the following with neat diagrams:
i) Solar azimuth angle ii) declination angle
c) Explain any one instrument for measuring solar radiation.
2. a) Discuss about the instruments used to measure beam component of solar radiation.
b) What is solar radiation data? What is the information provided in that .
(JNTU/December 2012)
3. (a) Discuss briefly various possible large scale applications of solar energy.
(b) Describe the solar power plant. (JNTU/December 2011)
4. (a) Write short notes on solar radiation on tilted surfaces. (JNTU/December 2011)
(b) State principle of solar thermo-electric converters.
5. (a) Describe, what are the main elements of a PV system. (JNTU/December 2011)
(b) Describe thermal energy storage system.
6. (a) What are the advantages and disadvantages at photovoltaic solar energy conversion?
(b) Discuss the economic feasibility of harnessing solar energy. (JNTU/December 2011)
- 7) 1. Explain the followings:
(a) Beam and diffus solar radiation
(b) The hour angle
(c) The Sun's declination
(d) The latitude and longitude (JNTU/MAY 2009)
- 8)
Explain the followings:
(a) Beam and diffus solar radiation
(b) The hour angle
(c) The Sun's declination
(d) The latitude and longitude. (JNTU/ JUNE 2010)
- 9) (a) Explain the operation of a closed cycle OTEC plant with neat diagram.
(b) Estimate the amount of electrical energy obtained from an OTEC plant working with surface water at 27 °C and with a temperature difference of 15 °C. Assume the density of ocean water as 1010 kg/m³, specific heat of water as 4200 J/kg K, turbine efficiency 0.75, generator efficiency 0.96 and diameter of tube 60 cm. The velocity of water is limited to 0.2 m/s. (JNTU/ JUNE 2010)

10)

- a) Compare different non Conventional energy resources and Conventional energy sources.
- b) Explain Beam solar radiation and diffuse solar radiation (JNTU/ NOV 2009)

11) (a) Draw the diagram of geothermal Field.

(b) Explain the potential of geothermal resources in India. (JNTU/ NOV 2010)

12) (a) Write short notes on solar radiation on tilted surfaces.

(b) State principle of solar thermo-electric converters. (JNTU/ DEC 2011)

13) (a) Explain extraterrestrial and terrestrial Radiation.

(b) Define the following :

i. Declination

ii. Altitude angle

iii. Solar Constant. (JNTU/ MAY 2011)

QUESTION BANK

UNIT-II

1. Explain the construction and working of solar flat plate collectors. Discuss the thermal analysis of flat plate collector? **(JNTU/May 2013)**
2. a) Explain about different types of concentrating collectors ?
b) Differentiate between Flat plate collectors and concentrating collectors ?
(JNTU/December 2012)
3. (a) Discuss the economic feasibility of harnessing solar energy.
(b) What is meant by renewable energy sources? **(JNTU/December 2011)**

4. (a) What is the principle collection of solar energy used in a non-connective Solarpond?
(b) Describe a passive solar space heating system. **(JNTU/December 2011)**

5. (a) Explain the principle of conversion of solar energy into heat.
(b) Why orientation is needed in concentrating type collectors?**(JNTU/December 2011)**

6. (a) Compare the following types of collectors.
i. Flat plate
ii. Paraboloidal
iii. Parabolic through
(b) Explain working of a solar thermal water pump. **(JNTU/December 2011)**

7) Data for a flat plate collector used for heating are given below:

Location and latitude: Coimbatore 11°00' N

Date and time: March 22, 14:30 - 15:30 (LST)

Average intensity of solar radiation (annual): 560W/m²

Collector tilt: 26°

No. of glass covers :2

Heat removal factor for collector: 0.82

Transmittance of glass :0.88

Absorptance of the plate: 0.93

Top loss coefficient for collector: 7.95W/m²C

Collector fluid temperature: 25 C

Ambient Temperature: 25 C

Calculate:

- (a) Solar altitude angle
(b) Incident angle
(c) Collector efficiency

8)

Describe the method of testing of solar collectors using water and air as heat transfer fluid.

- 9) (a) What are the sub classifications of hydrothermal convective system?
(b) Describe a liquid dominated system or wet steam field.
(c) A hot water geothermal plant of the total flow type, receives water at 250°C. The pressure at turbine inlet is 10 bar. The plant uses a direct contact type condenser that operates at 0.3 bar. The turbine has a polytropic efficiency of 70%. For a cycle, net output of 10MW. Calculate:
i. The hot water flow rate,
ii. The condenser cooling water flow rate,
iii. Cycle efficiency and
iv. Plant heat rate.

10)

- a) What are the different renewable energy resources? Explain.
b) Explain the solar radiation for flat surfaces and rotational surfaces.

11) Write short notes on the following

- (a) aerobic digestion
- (b) fermentation
- (c) gasification.

12) (a) Explain the difference between geothermal plant and thermal plant.

(b) Explain the various methods to extract geothermal energy.

13) (a) Describe the main applications of wind energy.

(b) What are the most favorable sites for installing of wind turbines?

QUESTION BANK

UNIT-III

1. Explain the construction and working of a solar pond with neat sketch. What are its advantages and disadvantages? **(JNTU/May 2013)**

2. Explain the principle and operation of non convective solar pond in detail.

(JNTU/December 2012)

3. (a) What is the principle collection of solar energy used in a non-connective Solar pond?

(b) Describe a passive solar space heating system.

(JNTU/December 2011)

4. (a) What is the principle of solar photovoltaic power generation. What are the main elements of a PV system?

(b) Explain the terrestrial solar radiation. .

(JNTU/December 2011)

- 5.(a)What is solar cell? Explain its principle of operation.
(b) What is solar energy? How solar energy may be utilized in generation of electrical power?

(JNTU/December 2011)

6. (a) Describe in brief, the different energy storage methods used in The solar systems.
(b) Distinguish between an abrupt and graded in Junction. **(JNTU/December 2011)**

7) (a) Discuss in detail about the mechanism of salt-gradient solar pond, with the aid of neat sketches.

- (b) Discuss the following
i. packed bed storage system,
ii. Photo-voltaic cell.

8)

- a) What are the various methods of storing solar energy.
b) Discuss in detail any two of the solar energy storage methods.

- 9) (a) List out Various non -Conventional Sources of energy.
(b) Brievely explain the advantages of renewable sources of energy.

(c) Explain briefly the causes of low power factor and how it can be corrected?

10) a) What are solar cells? Explain them with suitable diagram.

b) How is the solar energy concentrated in a flat plate collector? Explain.

- 11) (a) What are the advantages and disadvantages of ocean wave energy?
(b) How do you get power generation from tides using double basin arrangement?

Explain.

12) (a) Explain various configurations of KVIC biogas plants with neat sketches.

(b) Explain the process of anaerobic digestion.

13) (a) Explain the difference between geothermal plant and thermal plant

(b) Explain the various methods to extract geothermal energy.

QUESTION BANK

UNIT-IV

1. a) Discuss about different configurations of wind turbines and their advantage and disadvantages.
b) Discuss about the performance characteristics of wind turbines. **(JNTU/May 2013)**

2. a) What is Betz limit? Derive an expression for it?
b) Explain the advantages and disadvantages of any types of vertical axis wind turbines ?
(JNTU/December 2012)

3. (a) Derive the expression for power developed due to wind energy.
(b) What are the advantages and disadvantages of vertical axis wind mills over horizontal type?
(JNTU/December 2011)

4. (a) Describe the different Schemes for wind electric generation.
(b) Describe the generator control schemes. **(JNTU/December 2011)**

5. (a) Describe the main considerations in selecting a site for wind generators.
(b) Derive the expression for power developed due to wind. **(JNTU/December 2011)**

6. (a) Define:
 - i. Cut-in speed
 - ii. Cut-out speed
 - iii. Yaw control
 - iv. Coefficient of performance of a wind mill.(b) Classify wind energy conversion systems. **(JNTU/December 2011)**

- 7) (a) What is a wind-mill?
(b) What are the various classifications of a wind mill? Explain them in detail with neat sketches.

- 8)
 - a) Prove that the maximum power coefficient (C_p) for a wind mill is 0.593.
 - b) How are the wind mills classified?

- 9) (a) Enumerate the advantages and disadvantages of wind power.
(b) Write short notes on potential wind power in India.
(c) List few companies manufacturing WEC devices.
- 10)
a) Explain the main considerations in selecting a site for wind generators.
b) Derive the expression for maximum power generation for the wind mill.
- 11) (a) Describe with a neat diagram the operation of solar power plant.
(b) What are the main applications of drier.
- 12) (a) Discuss the economic feasibility of harnessing solar energy.
(b) What is meant by renewable energy sources?
- 13) (a) Enumerate the different main applications of solar energy.
(b) Write short notes on:
i. Solar cells
ii. Solar distillation

QUESTION BANK

UNIT-V

1. a) What is anaerobic digestion? Explain how biogas is produced by anaerobic digestion.
b) Explain the construction and working of Janata bio digester with a neat sketch
(JNTU/May 2013)
2. a) Explain the operation of IC engines with the bio gas and discuss their performance characteristics ?
b) Discuss about the operation of floating drum type bio digester with a neat sketch?
(JNTU/December 2012)
3. (a) Explain various configurations of KVIC biogas plants with neat sketches.
(b) Explain the process of anaerobic digestion. (JNTU/December 2011)
4. Explain the various factors affecting the generation of biogas. (JNTU/December 2011)

5. (a) Explain the construction of Chinese biogas plant.
(b) Classify biogas plants and discuss their salient features. **(JNTU/December 2011)**

6. Write short notes on the following:
(a) Figure of merit of thermo couple
(b) Fossil fuel cell
(c) Thermal ionization. **(JNTU/December 2011)**

7) Explain in detail about the factors which affect the bio-digestion.

8)

What are different biomass conversion technologies? Write about them in detail

9) Explain in brief the energy potential of ocean waves and methods of harnessing the wave energy.

10)

a) Explain the working principle of horizontal axis wind mill with suitable diagrams.

b) How to control the operation of wind mill? Explain its mechanism.

11) (a) State various subsystems in a solar thermal energy conversion

(b) Name three collectors requiring one axes tracking. Why?

12) (a) Define:

i. Cut-in speed

ii. Cut-out speed

iii. Yaw control

iv. Coefficient of performance of a wind mill.

(b) Classify wind energy conversion systems.

13) (a) State principle of solar thermo-electric converters.

(b) What are the main advantages and disadvantages of a solar furnace?

QUESTION BANK

UNIT-VI

1. a) What are the various types of geothermal resources?
b) Explain the energy extraction from hot dry rocks. **(JNTU/May 2013)**

2. a) Discuss about the sources of Geothermal energy and their potential in India ?
b) Explain the liquid dominated systems of geothermal energy ?
(JNTU/December 2012)

3. (a) Explain the operation of vapour dominated geoenery system with a neat schematic diagram.
(b) Explain the displacement machine with a neat sketch and mention its advantages and disadvantages. **(JNTU/December 2011)**

4. What are the difficulties in large scale utilization of geothermal energy? What development could increase the role of geothermal energy in future?
(JNTU/December 2011)

5. (a) Explain the principle and operation of a liquid dominated system with a neat sketch.
(b) Explain the displacement machine with a neat sketch and mention its advantages and disadvantages. **(JNTU/December 2011)**

6. (a) Explain the difference between geothermal plant and thermal plant.
(b) Explain the various methods to extract geothermal energy. **(JNTU/December 2011)**

- 7) (a) What are liquid dominated hydrothermal convective systems? Write about them.
(b) With the help of a neat diagram, explain the working of a liquid dominated double flash steam system.

- 8)
 - a) Discuss the prospects of geo thermal energy in context to India.
 - b) Explain how the space heating is done using geo thermal energy.

- 9) (a) Explain simple single pool tidal system with neat diagram.
(b) A tidal power scheme has 140 generators rated 60MW output each, and the

turbine operates at a maximum designed head of 10m. The minimum head at the end of generation is 2m. The number of hours of generation is on the average 6 at every tidal cycle (12 hours a day). Assume power to decrease linearly and the reservoir to have a rectangular cross section area. The length of embankment is 16km. The efficiency of turbine and generator are 93% each, calculate:

- i. The quantity of water owing through each turbine at maximum output in m^3/s .
- ii. The surface area of reservoir in km^2 .

10)

- a) What are different OTEC techniques for power generation? Explain.
- b) Differentiate between Waves and Tides. Explain the reasons for the formation of tides and waves.

- 11) (a) What is a solar cell? Explain principle of operation.
(b) Write short notes on solar distillation.

- 12) (a) What are the civil works design considerations for mini and micro hydel power plants?
(b) Explain the fundamental principle of tidal energy generation.

- 13) (a) Explain the working of Anderson cycle OTEC system with neat sketch.
(b) Explain the power generation from single ebb cycle system.

QUESTION BANK

UNIT-VII

1. a) Explain the closed cycle operation of OTEC system with neat schematic diagram.
b) Discuss about various types of turbines used for tidal energy conversion

(JNTU/May 2013)
2. a) Explain the open cycle operation of OTEC plant with neat schematic diagrams ?
b) Explain about the devices used for wave energy ?

(JNTU/December 2012)

3. (a) What are the civil works design considerations for mini and micro hydel power plants?

(b) Explain the fundamental principle of tidal energy generation.

(JNTU/December 2011)

4. (a) Discuss the various sources of energy available with oceans.

(b) Explain the methods for the utilization of tidal energy in single basin arrangement.

(JNTU/December 2011)

5. What are the difficulties in large scale utilization of geothermal energy? What Development could increase the role of geothermal energy in future?

(JNTU/December 2011)

6. (a) Explain the operation of vapour dominated geoenergy system with a neat schematic diagram.

(b) Explain the displacement machine with a neat sketch and mention its advantages and disadvantages.

(JNTU/December 2011)

7) (a) With reference to neat layout diagrams, explain the operation of a closed cycle OTEC plant.

(b) Find the quantity of water to be pumped to OTEC plant working with surface water at 27 C and with cold water at 8 C at a depth of 600 m from the surface to obtain 1.0 MW of thermal energy. Assume the density of ocean water as 1010 kg/m³ and the specific heat of water as 4200 J/kg K.

8)

a) With neat sketches explain the working of wave energy conversion machines.

b) Discuss the various important equipment for the establishment of an OTEC system off shore.

9) Write brief notes on the following:

(a) Central receiver system

(b) Solar farms

10)

a) What are the different types of bio-fuels used in power generation? Explain.

b) Explain the constructional features of binary fluid geothermal energy conversion system with suitable diagram.

11) (a) Explain with a neat diagram a wind electric generating power plant.

(b) Discuss the advantages and disadvantages of horizontal and vertical axis wind mills.

12) Explain the following with relevant expressions:

- (a) Seebeck effect
- (b) Peltier effect
- (c) Thomson effect.

- 13) (a) Explain petrochemical regenerative fuel cell.
(b) Explain liquid metal system of MHD power generation with neat schematic.

QUESTION BANK

UNIT-VIII

1. a) What is the need for DEC? What are its limitations?
b) Explain the thermionic energy conversion **(JNTU/May 2013)**
2. a) Explain direct energy conversion with any three examples ?
b) Discuss about Carnot cycle in detail. Derive an expression for efficiency of Carnot cycle ?
(JNTU/December 2012)
3. Explain the following with relevant expressions:
(a) Seebeck effect
(b) Peltier effect
(c) Thomson effect.
(JNTU/December 2011)
- 4) Explain the principle of MHD power generation?
(JNTU/December 2011)
- 5) (a) Explain the principle and working of MHD accelerator.
(b) Explain important factors to be considered for selecting materials for MHD generator
(JNTU/December 2011)
- 6) Explain about Fuel cell, its principle of operation and advantages of it?

7) Describe the operation of a thermionic converter.

8)

List the various direct energy conversion devices and explain the principle.

9) (a) What are the methods for obtaining energy from Bio-mass? Explain in brief.

(b) Describe the operation of Bio-gas plant with a neat sketch.

10)

Write short notes on:

a) Biogas digester.

b) Solar thermal energy conversion.

c) Energy Management and conservation.

11) (a) Define ionization. Explain various types of ionization.

(b) What is a fuel cell? Explain its operation.

(c) How many types of fuels are there? List them.

12) (a) What is the principle collection of solar energy used in a non-connective Solar pond?

(b) Describe a passive solar space heating system.

13) Explain the various factors affecting the generation of biogas.