PBR VISVODAYA INSTITUTE OF TECHNOLOGY & SCIENCE::KAVALI

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ACADEMIC YEAR : 2023 – 24
CLASS : IV B.TECH, I SEM
BRANCH : COMMON TO ALL BRANCHES
SUBJECT NAME RENEWABLE ENERGY SYSTEMS **(20A02705)**

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CO	COURSE OUTCOMES	K LEVEL
CO1	Understand various alternate sources of energy for different suitable application requirements	K2
CO2	Understand the concepts of PV Energy systems and its applications	K2
CO3	Understand the concepts of Wind energy, its coversion and its applications.	K2
CO4	Interpret the concept of geo thermal energy and its applications.	K2
CO5	Understand the use of biomass energy and the concept of Ocean energy and fuel cells.	K2

QUESTION BANK

Essay Questions

UNIT-I

Q. NO.	QUESTION	CO	K LEVEL
1	Define solar radiation and explain types of radiation with neat sketch?	1	K2
2	Explain the construction and principle of operation of solar measurement devices?	1	K3
3	Explain the terms: (i) Altitude angle(ii) Incident angle(iii) Zenith angle(iv) Solar azimuth angle (v) Latitude angle (vi) Declination angle(vii) Hour angle.	1	K3
4	Explain about solar flat plate collectors and principle of operation with neat sketch?	1	K3
5	Mention different types of concentrating collectors and explain any two of them with neat sketch?	1	K2
6	Explain about storage of solar energy and Describe thermal energy storage system with neat sketch.	1	K3

UNIT-II

Q.	QUESTION	CO	K

NO.			LEVEL
1	Describe the principle of solar photovoltaic energy conversion with neat sketch?	2	K2
2	Define solar cell and Explain the types of PV Cell?	2	K1
3	Explain about solar cell, module, panel and array with neat sketch?	2	K3
4	Explain about electrical characteristics of a silicon PV cells and modules?	2	K3
5	Explain the construction and principle of operation of PV systems for remote power (stand alone system)?	2	K3
6	Explain the construction and principle of operation of grid connected PV system?	**2**	**K3**

UNIT-III

Q. NO.	QUESTION	CO	K LEVEL
1	Explain briefly about the horizontal wind mills with neat sketch.	3	K3
2	Explain various designs of blades of VAWTs and their relative features.	3	K3
3	Explain the terms i. Yaw control ii. Pitch control iii. Lift & Drag	3	K3
4	Explain briefly about site selection consideration for WECS.	3	K3
5	Explain the wind power energy conversion with their relative features.	3	K3
6	Explain briefly about the horizontal wind mills with neat sketch.	3	**K3**

UNIT-IV

Q. NO.	QUESTION	CO	K LEVEL
1	Define and Classify Geothermal sources.	4	K1
2	Explain the analysis of the energy content and its extraction for a hot dry rock type geothermal resource	4	K3
3	Describe a Binary cycle system for liquid dominated system.	4	K2
4	Explain brief note on prospects of geothermal energy in India.	4	K3
5	Explain the dry steam power plant system with a neat sketch.	4	K3
6	Discus with a neat sketch about the operation of flashed steam geothermal power plant	4	**K2**

UNIT-V

Q. NO.	QUESTION	CO	K LEVEL
1	Explain the working principle of OTEC system and also mention its	4	K1

	limitations and advantages.		
2	Explain the working principle of wave energy and also mention its performance and limitations.	4	K3
3	Explain the working of a floating drum bio-gas generation plant with a neat sketch.	4	K2
4	Explain the working of a fixed dome bio-gas generation plant with a neat sketch.	4	K3
5	Explain the basic principle of fuel cells with the reference to H2–O2 fuel cells.	4	K3
6	Explain the basic principle of fuel cells with the reference to Methanol-Oxygen fuel cells.	4	**K2**

TWO MARKS

UNIT–I

Q. NO.	QUESTION
1	Define solar constant?
2	Define attenuation?
3	Explain about local solar time?
4	Explain about sunrise, sunset and day length?
5	Define solar collector?

UNIT–II

Q. NO.	QUESTION
1	Define PV cell?
2	Define photo voltaic effect?
3	Mention different materials used in solar cell?
4	Explain about thin film PV techonology?
5	Mention different types of PV systems?

UNIT–III

Q. NO.	QUESTION
1	What is the basic principle of wind energy conversion?
2	List out basic components of wind energy conversion system?

3	Distinguish between VAWT and HAWT systems?
4	Mention the applications of wind energy?
5	What is wind energy storage?

UNIT–IV

Q. NO.	QUESTION
1	Define the term geothermal energy?
2	How is geothermal energy produces?
3	Define the term magma?
4	What are advantages of geothermal systems?
5	What are the applications of geothermal energy?

UNIT–V

Q. NO.	QUESTION
1	Explain about basic principle of tidal energy?
2	Explain about basic principle of wave energy?
3	How biomass conversion takes place?
4	What is the difference between biomass and biogas?
5	Mention the types of fuel cell and its advantage?

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RENEWABLE ENERGY SYSTEMS (20a02705)

IV-B.TECH I-SEM

COMMON TO ALL

BIT BANK

Unit-I

1. **Which of the following energy has the greatest potential among all the sources of renewable energy?** [a]
   a) solar energy
   b) wind energy
   c) thermal energy
   d) hydro-electrical energy
2. **What is the rate of solar energy reaching the earth surface?** **[a]**
   a) 1016w
   b) 865w
   c) 2854w
   d) 1912w
3. **What is total amount of solar energy received by earth and atmosphere?** **[a]**
   a) 3.8 x 1024 j/year
   b) 9.2 x 1024 j/year
   c) 5.4 x 1024 j/year
   d) 2.1 x 1024 j/year
4. **Which is most common source of energy from which electricity is produced?** **[c]**
   a) hydroelectricity
   b) wind energy
   c) coal
   d) solar energy
5. **Oil is estimated to last for _____ more.** **[a]**
   a) 100 years
   b) 500 years
   c) a decade
   d) 800 years
6. **The time from sunrise to sunset is termed as _____** **[b]**
   a) slope
   B) day length
   C) local solar time
   D) solar intensity
7. **In what form is solar energy is radiated from the sun?** **[c]**
   a) ultraviolet radiation
   b) infrared radiation
   c) electromagnetic waves
   d) transverse waves
8. **What does mhd stands for in the energy field?** **[a]**
   a) magneto hydro dynamic
   b) metal hydrogen detox
   c) micro hybrid drive
   d) metering head differential
9. **solar radiation which reaches the surface without scattering or absorbed is called _____** [a]
   a) beam radiation
   b) infrared radiation
   c) ultraviolet radiation
   d) diffuse radiation
10. **The scattered solar radiation is called _____** **[c]**
    a) direct radiation
    b) beam radiation

c) diffuse radiation
d) infrared radiation

11. Solar radiation received at any point of earth is called _____ [a]
a) insolation
b) beam radiation
c) diffuse radiation
d) infrared rays

12. insolation is less _____ [a]
a) when the sun is low
b) when the sun right above head
c) at night
d) at sun rise

13. lst stands for _____ [b]
A) local standard time
B) local solar time
C) low surface temperature
D) land surface temperature

14. Which type of device is used to measure solar irradiance on a planar surface? [a]
A) pyranometer
B) net radiometer
C) gardon gauge
D) pyrheliomete

15. Instrument used to measure direct beam of solar irradiance is called_____ [d]
A) pyranometer
B) net radiometer
C) gardon gauge
D) pyrheliometer

16. The amount of energy received in unit time on a unit area perpendicular to the sun's direction at the mean distance of the earth from the sun is called _____ [b]
a) solar radiation
b) solar constant
c) intensity of solar radiation
d) air mass

17. What is 'n' in the following solar intensity formula? [a]
$i = isc \{1 + 0.033\cos(360n/365)\}$
a) day of the year
b) month of the year
c) the year
d) week of the year

18. When the sun is directly on the top of head, it as referred to _____ [a]
a) zenith
b) azimuth
c) declination
d) hour angle

19. Path length of radiation through the atmosphere to the length of path when the sun is at zenith is called _____ [b]
a) declination
b) air mass
c) azimuth
d) solar constant

20. Radiation intensity 'i' normal to the surface is given by _____ [a]
a) $i\cos\theta$
b) $i\tan\theta$
c) $i\cot\theta$
d) $i\sin\theta$

21. Angle made by radial line joining the location to the centre of the earth with the projection of the line on the equatorial plane is called _____ [a]

a) latitude
b) zenith angle
c) hour angle
d) declination

22. angular distance of sun's rays north or south of the equator is called _____[a]

a) declination
b) hour angle
c) latitude
d) air mass

23. By which of the following symbol is solar declination denoted by _____ [a]

a) δ
b) ρ
c) δ
d) γ

24. The angle through which the earth must turn to bring the meridian of a point directly in sun's rays is called _____ [a]

a) hour angle
b) declination
c) latitude
d) air mass

25. Solar altitude is also called as _____ [b]

a) declination
b) altitude angle
c) zenith angle
d) azimuth angle

26. the angle between the sun's rays and a line perpendicular to the horizontal plane through angle the beam of the sun and vertical is called _____ [b]

a) solar azimuth angle
b) zenith angle
c) altitude angle
d) declination

27. The solar angle in degrees along the horizon east or west of north or it is the horizontal angle measured from north to the horizontal projection of sun's rays is called _[a]

a) solar azimuth angle
b) zenith angle
c) altitude angle
d) declination

28. Angle made by plane surface with horizontal is called _____ [a]

a) slope
b) altitude angle
c) zenith angle
d) hour angle

29. The angle of deviation of the normal to the surface from the local meridian is called as _[a]

a) surface azimuth angle
b) solar azimuth angle
c) solar altitude
d) hour angle

30. The angle being measured from a plane and which is equal to angle between the beam of rays and normal to the plane is called _____ _ [a]

a) incident angle
b) azimuth angle
c) hour angle
d) declination

Unit-II

1. **A solar cell converts light energy into _____** **[a]**
   a) electrical energy
   b) thermal energy
   c) sound energy
   d) heat energy
2. **There are three types of the solar cells.** **[a]**
   a) true
   b) false
3. **Series and parallel combination of the solar cell is known as _____** **[a]**
   a) solar array
   b) solar light
   c) solar sight
   d) solar eye
4. **Full form of ff in the solar field is _____** **[b]**
   a) form factor
   b) fill factor
   c) face factor
   d) fire factor
5. **Calculate fill factor using the data: pmax=15 w, voc=18 v, isc=4 a.** **[c]**
   a) .65
   b) .59
   c) .20
   d) .98
6. **Permanent magnet dc motor is more expensive than an induction motor.** **[a]**
   a) true
   b) false
   C) .a&b
   d) .none
7. **Liquid heating collectors are mainly used for _____** **[a]**
   A) heating water
   B) generating electricity
   C) cooking
   D) trapping sunlight
8. **_____ is a glazing which limits the radiation and convection heat losses.** **[d]**
   A) absorber plate
   B) selective surface
   C) insulation
   D) transparent cove
9. **what are provided to minimize heat loss?** **[d]**
   A) absorber plate
   B) surface plate
   C) insulation
   D) casing
10. **Which part of flat plate collectors is coated in black?** **[b]**
    A) transparent cover
    B) absorber plate
    C) insulation
    D) fins

11. The frame which contains all the parts is called _____ [d]

A) box
B) plate
C) enclose
D) container

12. In which collector does air flow without any obstruction? [b]

A) porous absorber plate
B) non-porous absorber plate
C) over lapped glass absorber
D) finned absorbe

13. How is heat loss over come in liquid plate collectors? [a]

A) by insulation
B) by casing
C) by the transparent cover
D) from provided tubes

14. For what purpose are gas heating collectors used? [c]

A) to trap solar radiance
B) to act as a medium to help in conversion of sunlight to electrical energy
C) employed as solar air heaters
D) they act as alternate panels in case of failure

15. full form of bel is _____ [c]

a) busy electronics limited
b) burden electrical limited
c) bharat electronics limited
d) brahma electrical limited

16. material used for making solar cell is _____ [a]

a) silicon
b) carbon
c) sodium
d) magnesium

17. the term photo voltaic comes from _____ [b]

a) spanish
b) greek
c) german
d) english

18. The volt is the units of emf that was named after its inventor _____ [a]

a) alessandro volta
b) alxendervolta
c) alexa volta
d) alexandro volta

19. The term photo voltaic is in use since _____ [c]

a) 1840
b) 1844
c) 1849
d) 1850

20. When the source of light is not sun light then the photo voltaic cell is used as __ [c]

a) photo diode
b) photo voltaic cell
c) photo detector
d) photo transmitter

21. the region where the electrons and holes diffused across the junction is called [b]

a) depletion junction
b) depletion region

c) depletion space
d) depletion boundary

22. The current produce by the solar cell can be given by _____ [d]
a) il – id + ish
b) il + id – ish
c) il + id + ish
d) il – id – ish

23. The amount of photo generated current increases slightly with an increase in [a]
a) temperature
b) photons
c) diode current
d) shunt current

24. Solar cells are made from bulk materials that are cut into wafer of __thickness. [d]
a) 120-180μm
b) 120-220μm
c) 180-220μm
d) 180-240μm

25. __ is one of the most important materials is also known as solar grade silicon. [b]
a) crushed silicon
b) crystalline silicon
c) powdered silicon
d) silicon

26. _____ photo voltaic devices in the form of thin films. [a]
a) cadmium telluroide
b) cadmium oxide
c) cadmium sulphide
d) cadmium sulphate

27. . _____ is a direct band gap material. [a]
a) copper indium gallium selenide
b) copper selenide
c) copper gallium telluride
d) copper indium gallium diselenide

28. Dye-sensitized solar cells are made from _____ organic dye. [a]
a) ruthiummelallo
b) aniline
c) safranine
d) induline

29. Quantum dot solar cells are based on _____ [a]
a) gratzel cell
b) solar cell
c) voltaic cell
d) galvanic cell

30. The quantum dot used are _____ [a]
a) cds
b) cdte
c) pbo
d) gaas

UNIT-III

1. What does Heating and cooling of the atmosphere generates? [c]
a) Thermo line circulation
b) Radiation currents
c) Convection currents
d) Conduction currents
2. How much is the energy available in the winds over the earth surface is estimated to be?[b]
a) 2.9 X 120 MW
b) 1.6 X 107 MW
c) 1 MW
d) 5MW
3. How much wind power does India hold? [a]
a) 20,000 MW
b) 12,000 MW
c) 140,000 MW
d) 5000 MW
4. What is the main source for the formation of wind? [b]
a) Uneven land
b) Sun
c) Vegetation
d) Seasons
5. Which country created wind mills? [c]
a) Egypt
b) Mongolia
c) Iran
d) Japan
6. "During the day, the air above the land heats up more quickly than the air over water". [a]
a) True
b) False
c) a&b
d) none
7. What happens when the land near the earth's equator is heated? [d]
a) All the oceans get heated up
b) Small wind currents are formed
c) Rise in tides
d) Large atmospheric winds are created
8. What type of energy is wind energy? [a]
a) Renewable energy
b) Non-renewable energy
c) Conventional energy
d) Commercial energy
9. What are used to turn wind energy into electrical energy? [a]
a) Turbine
b) Generators
c) Yaw motor
d) Blades
10. What is the diameter of wind turbine blades? [b]
a) 320 feet
b) 220 feet
c) 80 feet
d) 500 feet
11. How much power does the small-scale wind machine generate? [b]
a) 18 KW
b) 2 KW

c) 12 KW
d) 30 KW
12. Which type of wind machines are used at several residence or local use? [d]
a) Large size machines
b) Remote machines
c) Small size machines
d) Medium size machines
13. Which type of wind turbines produce 100 kW or greater? [a]
a) Large machines
b) Small machines
c) Medium machines
d) Remote Machines
14. Which part of the wind mill acts as a housing for the turbine? [c]
a) Wind Vane
b) Shaft
c) Wind mill head
d) Turbine
15. A rotor installed in a fixed orientation with the swept area perpendicular to the pre-dominate wind direction is called _____ [b]
a) Nacelle
b) Yaw fixed machines
c) Blades
d) Anemometer
16. How is the action of yaw controlled in small turbines? [a]
a) Tail vane
b) Blades
c) Shaft
d) Yaw motor
17. Which part of the wind turbines senses wind speed, wind direction, shaft speed and torque? [d]
a) Turbine blade
b) Shaft
c) Rotor
d) Controller
18. Which type of wind turbine has low RPM? [b]
a) Small wind turbine
b) Large wind turbine
c) Medium wind turbine
d) Remote wind turbine
19. Why recommendation of fixed ratio gears done for top mounted equipment? [d]
a) Because they are easy install
b) Requires less space
c) Due to its low cost
d) Because of their high efficiency
20. Which type of generator are made use in wind turbines? [b]
a) Recreational generators
b) Synchronous generator
c) Asynchronous generator
d) Alternator

UNIT-IV

1. The process of producing energy by utilizing heat trapped inside the earth surface is called _____ [b]

a) Hydrothermal energy
b) Geo-Thermal energy
c) Solar energy
d) Wave energy

2. How much is the average temperature at depth of 10 km of earth surface? [a]

a) 200^{o}C
b) 900^{o}C
c) 650^{o}C
d) 20^{o}C

3. What is hot molten rock called? [b]

a) Lava
b) Magma
c) Igneous rocks
d) Volcano

4. How many kinds of Geo thermal steams are there? [a]

a) 2
b) 3
c) 4
d) 5

5. What does EGS stand for in geothermal energy? [b]

a) Engraved Geothermal systems
b) Enhanced geothermal system
c) Exhaust gas system
d) Engineered geo physical system

6. Who invented first geothermal plant? [b]

a) Michael Faraday
b) Piero Ginori Conti
c) Enrico Fermi
d) Guglielmo Marconi

7. A geothermal solution containing appreciable amounts of sodium chloride or other salts is called as __ [b]

a) Fluids
b) Brine
c) Solvent
d) Magma

8. Earth's outer layer rock is called as _____ [b]

a) Mantle
b) Crust
c) Outer core
d) Asthenosphere

9. The hole on earth's surface from where the steam from the earth comes out is called as _____ [d]

a) Gash
b) Mud pot
c) Void
d) Fumarole

10. A spring that shoots jets of hot water and steam into the air is called as _____ [b]

a) Mine hole
b) Geyser
c) Hot spring
d) Mud pot

11. What are the types of geothermal energy resources? [a]
a) Hydrothermal, geo-pressurised brines, hot dry rocks, magma
b) Hydrothermal, geo-pressurised brines, hot dry rocks, sun
c) Biomass, geo-pressurised brines, hot dry rocks
d) Wind, magma, geopressured brines, hydrothermal
12. What are the forms of geothermal energy? [b]
a) Liquid and solid
b) Liquid and vapour
c) Solid and Bose-Einstein condensate
d) Plasma and liquid
13. What is/are the ingredient in hydrothermal plants? [c]
a) Water
b) Hot water
c) Hot water and steam
d) Steam and water
14. Which of the following naturally occurring heater is best responsible for the hot water in a geothermal site?[d]
a) Solar heater
b) Induction stove
c) Sunlight
d) Magma
15. Which of the following affect the usage of hydrothermal resources? [a]
a) Temperature and depth of the source
b) Temperature and location of the site
c) Location of the site and depth of the source
d) Type of water and steam
16. Which temperature range is most suitable for directly using the hydrothermal resource? Note that "F" stands for Fahrenheit. [b]
a) 100 – 150 degree F
b) 50 – 60 degree F
c) -100 – -90 degree F
d) -100 – 0 degree F
17. _____ directly use low temperature hydrothermal source. [c]
a) Electricity generation
b) Waste treatment
c) Spas
d) Gas stove
18. Which of the following temperature ranges is most suitable to generate electricity from hydrothermal resources? Note that "F" stands for Fahrenheit. [d]
a) 100 – 150 degree F
b) 55 – 60 degree F
c) -200 – -90 degree F
d) 300 – 700 degree F
19. Which of the following best indicates the electricity generation from dry steam? [a]
a) Drilling well → steam → pipes → generator
b) Steam → drilling well → pipes → generator
c) Steam → pipes → drilling well → generator
d) Generator → steam → pipes → drilling well

20. Which of the following best indicates the electricity generation from hot water geothermal source? [b]
a) Drilling well → hot water → generator → steam
b) Drilling well → hot water → steam → generator
c) Generator → hot water → steam → drilling well
d) Hot water → steam → drilling well → generator

UNIT-V

1. What is ocean thermal energy conversion? [a]
a) Harnessing the temperature differences between surface waters and deep ocean waters
b) Harnessing the temperature differences between the coastal waters and deep ocean waters
c) Harnessing the heat energy from the underwater volcanoes
d) Harnessing the heat energy between surface water vapour and atmospheric gases
2. What is the temperature difference used in ocean thermal energy conversion? Note that F denotes Fahrenheit [b]
a) 10 degree F
b) A minimum of 77 degree F
c) Between 50 and 60 degree F
d) A minimum of 100 degree F
3. What is thermohaline circulation? [c]
a) Circulation of halogens throughout the ocean
b) Circulation of halogens due to temperature differences throughout the ocean
c) Large scale ocean circulation driven by global density gradients
d) Large scale halogens circulation due to global density gradients
4. What is the maximum estimated potential of ocean thermal energy conversion per year?[d]
a) 80 GWh
b) 900 MWh
c) 10000 TWh
d) 88000 TWh
5. How does the cold and denser water masses sink to the depths of ocean? [a]
a) Thermohaline circulation
b) Temperature gradient
c) Density gradient
d) Freshwater fluxes
6. Why is ocean thermal energy conversion a renewable resource? [b]
a) Because the temperature gradient lasts for a short period of time
b) Because the upwelling of cold water from the deep ocean is replaced by downwelling of surface waters
c) Because ocean water is available in plenty
d) Because of sun’s heat
7. Which of the following are types of systems used in ocean thermal energy conversion?[c]
a) Horizontal and vertical
b) Vertical and open cycle
c) Open cycle and closed cycle
d) Horizontal and closed cycle
8. Which of the following is used as working fluid in closed cycle oceanic thermal energy conversion systems? [d]
a) Thermohaline circulation
b) Temperature gradient
c) Greenhouse gases
d) Refrigerants
9. _____ turbine is used in closed cycle ocean thermal energy conversion. [b]
a) Horizontal
b) Low-pressure
c) High-pressure
d) Vertical
10. Open cycle ocean thermal energy conversion systems use _____ as the working fluid.[c]
a) vapour from rivers
b) water from rivers
c) vapour from seawater
d) seawater

11. Which of the following can be classified under solid biomass? [a]
a) Agricultural residues
b) Waste water
c) Industrial effluents into rivers
d) Plastic
12. What are energy crops? [b]
a) Crops grown to remove insects
b) Crops grown to be used in generating energy
c) Crops grown to feed people
d) Crops that produce energy
13. Which of the following are examples of energy crops? [c]
a) Banyan
b) Mango
c) Herbaceous and woody
d) Apple and herbaceous
14. What are herbaceous crops? [d]
a) Insecticides
b) Rice
c) Agricultural fertilizers
d) Agricultural by-products
15. Which of the following are examples of woody biomass? [a]
a) Fallen trees due to natural disasters
b) Mint
c) Columbine
d) Agricultural by-products
16. Fuel cell converts chemical energy to electrical energy using a reaction that ____ [a]
a) eliminates combustion of fuel
b) requires combustion of fuel
c) requires no ignition of fuel
d) fuel is not required
17. Fuel cell performance is not limited by _____ [b]
a) First law of Thermodynamics
b) Second law of Thermodynamics
c) Third law of Thermodynamics
d) All three laws are applicable
18. For which of these devices does negative charge carriers flow from anode to cathode in the external circuit? [d]
a) MHD generator
b) Thermionic generator
c) Thermoelectric generator
d) Fuel cell
19. The fuel cell is considered a battery in which _____ is continuously replaced. [c]
a) fuel only
b) oxidizer
c) both fuel and oxidizer
d) none of the mentioned
20. The type of reactions in a fuel cell is not determined by _____ [d]
a) fuel and oxidizer combination
b) composition of electrolyte
c) materials of anode and cathode
d) catalytic effects of reaction container