Short Answer Questions

UNIT-I

1. What are the examples of conventional energy sources?
2. Explain energy planning and energy management
3. Give the destructive effects of conventional energy sources
4. Define energy efficiency
5. What is energy planning and why do we require energy management
6. What is Green House effect?
7. Explain the differences between conventional energy sources and non-conventional energy sources.
8. What are the advantages of conventional energy sources and non-conventional energy sources?
9. What are nonconventional energy sources? Give two examples of them.
10. Define Energy efficiency
11. Write the differences between Renewable energy sources and Non-renewable energy sources.
12. Explain the importance of Spaghetti and Pie diagrams
13. What is energy planning? Why do we require energy management?
14. What are conventional energy sources? Give two examples of them.
15. What is global warming? Give two reasons for it.
16. Distinguish between conventional and non-conventional energy sources.
17. Explain energy planning and energy management.
18. Explain natural energy currents on earth.
19. Give the destruction effects of conventional energy sources.
20. Enumerate all the non-conventional energy sources related to solar energy.

UNIT-II

1. Explain terrestrial and extra-terrestrial solar radiation.
2. Write short notes on concentrating collectors
3. Explain solar thermal conversion
4. What is Fresnel lens?
5. Explain current – voltage characteristics of a solar cell.
6. Explain water heating and air heating using solar energy
7. What are the reasons for low efficiency of solar cells?
8. Distinguish between North-South orientation and East-West orientation of solar panel
9. Short notes on Flat plate collectors
10. Explain the effects of emission of greenhouse gases in detail.
11. What is Maximum Power Point (MPP) tracking?
12. What is 'Fill factor'? Explain.
13. Define (i) solar constant (ii) Incident angle (iii) latitude angle

14. Differentiate flat plate collectors and concentrating collectors.
15. What is Winston's profile?
16. Why do we need tracking system?
17. Explain about the tracking control of a solar panel.
18. What are the two power electronic converters used to step up or step down the voltage levels of solar panel?
19. 'Sea is the God given solar pond'. Which technology is exploited in generating power through the solar pond as Sea?
20. In PV module electromagnetic fields are generated when sun rays fall - To which theory it is related to?

UNIT-III

1. What is wind? How much amount of energy is contained in the wind?
2. Write the short notes on Darrius rotor
3. Explain horizontal axis wind turbine main components and their function.
4. What are the basic components of the horizontal wind mill.
5. How do you classify windmills? Explain any one type with neat sketches.
6. What is a windmill? What are various classifications of a windmill? Explain them in detail with neat sketches.
7. With the help of diagram, explain the terms, (i) Free and relative wind velocities (ii) Drag and lift forces and (iii) Pitch angle and chord
8. Derive an expression for energy available in the wind.
9. What are the factors to be considered to the site selection of windmill?
10. Draw the performance characteristic curves of different windmills.
11. Define, (i) cut-in speed (ii) Cut-out speed (iii) Yaw control (iv) Coefficient of performance of a windmill.
12. Write short notes on Savonius rotor.
13. Why tall tower is essential for mounting a horizontal axis wind turbine?
14. Why does a wind turbines have 3-blades?
15. What are the main considerations while designing a wind turbine blade?
16. What is Betz criteria?
17. Using Betz model of wind turbine derive an expression for power extracted from wind.
18. What are various characteristics of the wind? Discuss them in detail.
19. List out the difficulties encountered in general in operating large wind power generators.
20. Describe the main considerations in selecting a site for wind generators.
21. What is tower shadowing effect?

UNIT-IV

1. Explain the advantages, limitations and operational difficulties encountered in OTEC plants.
2. Explain the working principle of OTEC plant.
3. Explain briefly the working of open cycle OTEC plant.
4. Explain the closed cycle OTEC system with advantages and disadvantages over the open cycle OTEC plant.
5. What is the basic principle of OTEC? Describe the closed cycle OTEC system with its advantages over open cycle system.
6. How do tides occur? How many tides occur during a lunar day?
7. Explain the fundamental principle of tidal energy generation
8. Explain various methods for utilization of the tidal energy
9. Explain the methods of the utilization of tidal energy in single basin arrangement.
10. Explain the power generation from single pool (single basin) single tide system
11. Why power generation in single basin single tide system is intermittent?
12. How to achieve continuous power from a single tide system?
13. What are the factors to be considered for the selection of site for the tidal plant?
14. What are the areas that are convenient to erect tidal power plants in India?
15. What are the main advantages and disadvantages of ocean wave energy?
16. Discuss the advantages and limitations of wave energy conversion
17. Show the method of harnessing the energy potential associated with ocean tides.
18. What are the environmental issues with OTEC plants?
19. How can the power generated be utilized without transmitting to the long distances?
20. Write a few places where tidal energies generated?
21. What types of turbines are used in the tidal plants?

UNIT-V

1. What is geothermal energy? Explain.
2. Discuss the applications of geothermal energy
3. What are the advantages of geothermal energy over other energy forms?
4. What are the prime movers used in geothermal energy conversion system?
5. How to extract the geothermal energy from the hot dry rocks? Explain.
6. Explain how heat is extracted from hot dry rocks.
7. Explain the potential of geothermal resources in India.
8. Discuss the prospects of geothermal energy in context to India.
9. What are the factors affecting the performance of biogas digester?
10. Explain in detail about the factors which affect the bio-digestion.
11. What are the different phases of anaerobic digestion? Explain.
12. Explain various bio-mass energy conversion technologies in detail.
13. What are the applications of biogas? Can it be used as a fuel in IC engine? Is it economical to use it for IC engines?
14. What are the factors to be considered for the selection of site for the biogas plant?
15. What are the factors that affect the size of biogas plant?
16. Write about the biochemical processes that occur in anaerobic digestion.
17. Give the potential areas where geothermal energy is proposed.

18. Write the process of utilization of municipal garbage for generation of power.
19. Give examples of some bio-mass digesters available in Telangana and Andhra Pradesh areas?
20. Explain how 'Bagasse' is utilized in the sugar co-generation plants.

Long Answer Questions

Unit 1

1. Explain the differences between conventional energy sources and non-conventional energy sources.
2. What are the advantages of non-renewable energy sources and renewable energy sources?
3. Explain the importance of Spaghetti and Pie diagrams
4. What is energy planning? Why do we require energy management?
5. Explain the destruction effects of conventional energy sources in detail.

Unit 2

1. Explain in detail the different types of PV cells based on the thickness of the material used for their fabrication.
2. Discuss the reasons for low efficiency of solar cells in detail
3. A solar cell (0.9cm2) receives solar radiation with photons of 1.8eV energy having an intensity of 0.9mW/cm2. Measurements show open circuit voltage of 0.6V/cm2, short circuit current of 10mA/cm2 and the maximum current is 50% of the short circuit current. The efficiency of the cell is 25%. Calculate the maximum voltage that the cell can give and also find the Fill-factor.
4. A photo voltaic cell has $I_0=2x10^{-2}$ amps. Measurements show short circuit current I_{sc} as 30mA per an area of $1cm^2$. Find the maximum power output, Fill factor, and the conversion efficiency.

| V | 0.5 | 0.52 | 0.53 | 0.54 | 0.56 |

I	29.6	29.0	28.6	27.9	25.5

5. What is the optimum load to be connected for the above PV cell? What is maximum power point tracking?

6. Explain about the tracking control of a solar panel in detail.

UNIT 3

1. What Betz constant? Prove the maximum power coefficient C_P for a windmill is 0.593.
2. Describe the basic components of the horizontal wind mill in detail.
3. Draw and the performance characteristic curves of different windmills and explain salient points
4. Show that for horizontal wind mill the maximum power can be obtained when exit velocity= (wind velocity)/3 and the maximum power is $(8/27)(\rho AV^3)$

5. Calculate the total thrust and aerodynamic power developed in a 3-blade wind turbine at wind velocity of 9m/sec. The machine specifications are as follows:

Diameter=9m, Rotational speed=100rpm, Blade length=4m, Tip speed ratio=5.23, Chord length=0.45m, pitch angle=5^0, Aerofoil section:NACA23018, Distance from shaft to inner edge of the blade=0.5m

$i_1=24.81^0$	$C_{L1}=0.95$	$C_{D1}=0.0105$
$i_2=10.98^0$	$C_{L2}=1.20$	$C_{D2}=0.0143$
$i_3=5.81^0$	$C_{L3}=0.75$	$C_{D3}=0.0092$
$i_4=3.15^0$	$C_{L4}=0.46$	$C_{D4}=0.0078$

7. Explain the working principle of horizontal axis windmill with suitable diagrams.
8. Explain how to decide the number of blades of a wind turbine considering the tower shadowing effect.

UNIT 4

1. A simple single basin type tidal power plant has basin area of 22 km^2. The tide has a range of 10m. The turbine stops operation when the head on it falls below 3m. 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 is 1.025

2. Derive expression for the average theoretical power generated from a single basin single tide scheme during one filling. The expression to be derived is $P=0.225AR^2$ MW where A is area of basin, in m^2; R is tidal range, in m
3. A simple single basin type tidal power plant has basin area of 20 km X 3km. The tide has a range of 1.5m. Calculate the average power generated during one filling/emptying process in MW if the tidal range is increased to 2m. Take specific gravity of sea water is $1.025X10^3 kg/m^3$ and $g=9.81 m/sec^2$
4. Explain the power generation from double pool (double basin) single tide system
5. With reference to neat layout diagrams, explain the operation of a closed cycle OTEC plant
6. With a schematic diagram, explain the working of open cycle OTEC plant in detail.

UNIT 5

1. How to extract the geothermal energy from the hot dry rocks? Explain in detail.
2. With the help of neat diagram, explain how heat is extracted from hot dry rocks in detail.
3. Explain the potential of geothermal resources in India.
4. Explain various methods of extraction of geothermal energy
5. Explain various bio-mass energy conversion technologies in detail.