

6. The electrical output of a solar cell depends on the [K₁]
- a) Intensity of solar radiation b) Heat component of solar radiation
c) Coal furnace d) Wood based furnace
7. Sequence the energy flow in a roof-top wind mill [K₁]
- i) Wind created due to density difference ii) mechanical energy to electrical energy
iii) kinetic energy to mechanical energy iv) electrical energy to chemical energy
- a) i-iii-ii-iv b) ii-i-iii-iv
c) ii-iii-i-iv d) iv-iii-ii-i
8. A pyr heliometer is an instrument used to measure the [K₁]
- a) Temperature of solar photovoltaic cell b) Intensity of direct solar radiation at normal incidence
c) Intensity of indirect solar radiation d) Efficiency of a solar photovoltaic cell
9. The type of thermal energy stored for short intervals is [K₁]
- a) Buffer storage b) Diurnal storage
c) Annual storage d) Sensible heat storage
10. Match the following source with the concerned energy [K₁]
- | | |
|----------|----------------------|
| 1) Ocean | i) Solar energy |
| 2) Sun | ii) Nuclear energy |
| 3) Atom | iii) Kinetic energy |
| 4) Wind | iv) Potential energy |
| 5) Dam | v) Tidal energy |
- a) 1-v, 2-i, 3-ii, 4-iii, 5-iv b) 1-iv, 2-i, 3-ii, 4-iii, 5-v
c) 1-iv, 2-i, 3-iii, 4-ii, 5-v d) 1-v, 2-ii, 3-iii, 4-i, 5-iv

PART B (10 x 2 = 20 Marks)

11. Express solar flux calculation on any day of a year. [K₂]
12. Define solar constant. [K₁]
13. Define surface emissivity. [K₁]
14. State Kirchhoff's law. [K₂]
15. Differentiate thermal storage from photovoltaic. [K₄]

16. Express thermal analysis of concentrating collector. [K₂]
17. Write down the applications of solar energy. [K₂]
18. State the applications of solar gel pond. [K₂]
19. Define solar desalination. [K₁]
20. Categorize the applications of solar energy. [K₄]

PART C (10 x 5 = 50 Marks)

21. Explain active and passive methods of space heating with neat sketch. [K₂]
22. Compare the types of solar energy storage systems. [K₄]
23. Explain the radiation characteristics of opaque materials. [K₂]
24. Explain the working principle of pyr heliometer with neat sketch in detail. [K₂]
25. Compare the performance and testing of types of flat plate collectors in detail. [K₄]
26. List out the modes of tracking and illustrate the best one to harvest an optimum energy. [K₃]
27. Express the performance analysis of a compound parabolic concentrating collector. [K₂]
28. Explain different modes of orientation and tracking modes of concentrating collectors. [K₂]
29. Explain the solar gel pond and its application. [K₂]
30. Discuss about solar drying and its application in detail. [K₂]

PART D (2 x 10 = 20 Marks)

31. A CPC is mounted on a horizontal E-W axis and oriented with its aperture plane sloping at an angle of 40°. The concentration ratio of the collector is 6.5, the width of its absorber plate is 6cm and its length is 2m. The collector used is for heating a fluid ($C_p = 2.35 \text{ kJ/kg-K}$) which enters at a temperature of 130°C. Calculate the exit temperature of the fluid and the instantaneous collection efficiency for the following situation. [K₄]
Location of collector = New Delhi (28.58°N)
Date = Nov 5
Time = 1100h LAT
 $I_g = 0.735 \text{ kW/m}^2$
 $I_d = 0.162 \text{ kW/m}^2$

No. of tubes = 2

Tube outer diameter = 18mm

Tube inner diameter = 14mm

Transmissivity of glass cover = 0.89

Reflectivity of concentrator = 0.87

Absorptivity of absorber surface = $10.5 \text{ W/m}^2\text{-K}$

Heat transfer coefficient on inside of absorber tube = $230 \text{ W/m}^2\text{-K}$

Mass flow rate of fluid = 1.25 kg/min

Ambient temperature = 21°C

32. Explain thermal energy storage system and its applications in detail.

[K₂]
