Instructions –

1. All Questions are Compulsory.

2. Answer each next main Question on a new page.

3. Illustrate your answers with neat sketches wherever necessary.

4. Figures to the right indicate full marks.

5. Assume suitable data, if necessary.

6. Use of Non-programmable Electronic Pocket Calculator is permissible.

7. Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. a) Attempt any THREE of the following: 12

(i) Who are the members of OPEC? Explain the policies of OPEC.

(ii) State any four advantages and disadvantages of nuclear power plant.

(iii) Define:
   1) Declination Angle (\(\delta\))
   2) Solar Incidence Angle (\(\varphi\))

(iv) Give classification of wind mills.
b) Attempt any **ONE** of the following:  

(i) Explain with neat sketch natural circulation solar water heating system.

(ii) Explain co-generation process in sugar factory.

2. Attempt any **FOUR** of the following:  

a) Define:

(i) Solar Altitude Angle (\(\alpha\))

(ii) Solar Zenith Angle (\(\varnothing z\))

b) State advantages and limitations of concentrating collectors over flat plate collectors.

c) Explain the factors considered for selection of suitable sites for wind mill power plants.

d) Explain the benefits of biomass as energy.

e) Explain working of economiser with neat sketch.

f) Explain biomasses and describe algae with its advantages.

3. Attempt any **TWO** of the following:  

a) State the need of alternate energy sources. What is the prospect of alternate energy sources in Indian context?

b) Explain the structure of Sun with neat sketch.

c) Define biomass. Enlist various methods for obtaining energy from biomass.
4. a) Attempt any THREE of the following: 12
   (i) What is photovoltaic material? Explain.
   (ii) What is Magnus effect?
   (iii) What is biodiesel? State any four applications.
   (iv) Explain payback period. State its advantages and limitations.

   b) Attempt any ONE of the following: 6
      (i) Explain classification of hydroelectric power plants.
      (ii) What is sankey diagram? Explain sankey diagram for boiler plant and furnace.

5. Attempt any FOUR of the following: 16
   a) What is the impact of cooling tower on environment?
   b) What is acid rain? Explain.
   c) Explain with neat sketch Solar Evacuated Tube Collector (ETC).
   d) Explain the pitch control mechanism for wind turbine blade.
   e) What are the advantages and disadvantages of fixed dome type biogas plant?
   f) Classify various biomass conversion routes and explain anaerobic digestion.

6. Attempt any TWO of the following: 16
   a) Explain construction and working of winter green house and summer green house.
   b) Draw basic structure of wind mill and explain its various components.
   c) What is energy audit? Explain energy audit of boilers in detail.