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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute Affiliated to AKTU, Lucknow)

M.Tech

SEM: I - THEORY EXAMINATION (2025 - 2026)

Subject: Renewable Energy System

Time: 3 Hours

Max. Marks: 70

General Instructions:

IMP: Verify that you have received the question paper with the correct course, code, branch etc.

1. This Question paper comprises of **three Sections -A, B, & C**. It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.

2. Maximum marks for each question are indicated on right -hand side of each question.

3. Illustrate your answers with neat sketches wherever necessary.

4. Assume suitable data if necessary.

5. Preferably, write the answers in sequential order.

6. No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.

SECTION-A

15

1. Attempt all parts:-

1-a. What are three relevant bands of solar radiation? (CO1,K1)

1

- (a) UV, infrared and far infrared
- (b) UV, visible and infrared
- (c) Ultrasonic, infrared, and visible
- (d) UV, ultrasonic and near infrared

1-b. When is the power density of the absorbing surface equal to the incident sunlight? (CO2,K2)

1

- (a) Absorbing surface and incident sunlight are perpendicular to each other
- (b) Absorbing surface and incident sunlight are parallel to each other
- (c) Absorbing surface and incident sunlight are inclined at an acute angle to each other
- (d) Absorbing surface and incident sunlight are inclined at an obtuse angle to each other

1-c. Which of the following surrounds the earth's core? (CO3,K1)

1

- (a) Mt. Everest
- (b) Crust
- (c) Hydrogen
- (d) Mantle

1-d. In terms of greenhouse gas emissions, how good or bad is hydrogen fuel? (CO4,K2)

1

- (a) Major contributor of greenhouse gas emissions
- (b) Zero-emission fuel
- (c) Lowest contributor of greenhouse gas emissions
- (d) Hydrogen cannot be used as fuel

- 1-e. What is IPCC? (CO5,K1) 1
- (a) C31A government organization that provides scientific information regarding climate change and its effects
- (b) An intergovernmental body of UN that provides scientific information regarding climate change and its effects
- (c) An intergovernmental organization that provides scientific information regarding climate change and its effects
- (d) A private company that sells scientific information regarding climate change

2. Attempt all parts:-

- 2.a. What are the four main types of thermo-chemical processes? (CO1,K1) 2
- 2.b. What are oil seed crops? (CO2,K1) 2
- 2.c. Write short notes on aerodynamics. (CO3,K2) 2
- 2.d. Explain the principle of wind energy conversion (CO4,K2) 2
- 2.e. Define hydrograph. (CO5,K1) 2

SECTION-B

20

3. Attempt all parts:-

3.a. Answer any one of the following:-

- 3.a.(i) What strategies can be employed to minimize the environmental impacts of conventional energy usage? (CO1, K3) 4

- 3.a.(ii) Write short note about the sun's declination and hour angle. (CO1,K2) 4

3.b. Answer any one of the following:-

- 3.b.(i) Describe the principles and applications of solar water heating systems. How do these systems contribute to energy savings in residential and industrial settings? (CO2, K3) 4

- 3.b.(ii) Differentiate Francis turbine between Kaplan turbines.(CO2,K2) 4

3.c. Answer any one of the following:-

- 3.c.(i) Explain the process of optimization of utilization of Biomass. (CO3,K3) 4

- 3.c.(ii) With the help of neat sketch explain biogas generation in Deenbandhu Biogas plant. (CO3,K2) 4

3.d. Answer any one of the following:-

- 3.d.(i) What are the advantages of wind power? (CO2,K2) 4

- 3.d.(ii) Explain horizontal axis windmills with the help of neat sketch. (CO4,K2) 4

3.e. Answer any one of the following:-

- 3.e.(i) Explain wind diesel hybrid system. (CO5,K3) 4

- 3.e.(ii) Write short notes on Savonius rotor and Darrius rotor. (CO5,K2) 4

SECTION-C

35

4. Answer any one of the following:-

- 4-a. Explain and derive expression for beam and diffuse radiation. (CO1,K4) 7

- 4-b. Express solar constant with neat diagram. (CO1,K2) 7

5. Answer any one of the following:-

- 5-a. What is surge tanks and state its purpose. (CO2,K2) 7
- 5-b. Explain the various factors to be considered in the selection of a hydraulic turbine. (CO2,K4) 7
6. Answer any one of the following:-
- 6-a. “Bio Energy is very useful for rural applications”, justify the statement (CO3,K4) 7
- 6-b. Compare fixed dome type biogas plant and floating drum type plant. (CO3,K4) 7
7. Answer any one of the following:-
- 7-a. Explain the main applications of wind energy. (CO4,K3) 7
- 7-b. What is the principle used in the measurement of speed of the wind? (CO4,K2) 7
8. Answer any one of the following:-
- 8-a. Why a tall tower is essential for mounting a horizontal axis wind turbine? (CO5,K3) 7
- 8-b. State the essential features of a probable site for a wind farm. (CO5,K3) 7

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