

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

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

B.Tech

SEM: IX - THEORY EXAMINATION (2025 - 2026)

Subject: Sustainable Technologies

Time: 3 Hours

Max. Marks: 100

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

20

1. Attempt all parts:-

- 1-a. The term "carbon footprint" refer to _____.(CO1,K1) 1
- (a) The amount of carbon dioxide released into the atmosphere
- (b) The size of a person's shoe
- (c) The impact of a person's actions on the environment
- (d) The total energy consumption of a country
- 1-b. The purpose of sustainable waste management is _____ (CO1, K2). 1
- (a) To increase landfill space
- (b) To promote recycling and reduce waste generation
- (c) To encourage littering
- (d) To maximize resource depletion
- 1-c. The primary focus of social metrics in technology evaluation is identified as _____.(CO2, K2) 1
- (a) Environmental preservation
- (b) Economic growth
- (c) Well-being of society
- (d) Technological innovation
- 1-d. At which complexity level does the metric that evaluates the potential impact of technology on facility personnel, the environment, and surrounding communities fall?(CO2,K1) 1
- (a) Level 1
- (b) Level 2
- (c) Level 3

- (d) Level 4
- 1-e. Best describes the concept of a Circular Economy:(CO3,K2) 1
- (a) A system that focuses on reusing, recycling, and reducing waste to keep resources in use for as long as possible.
 - (b) Producing and consuming goods without considering waste management
 - (c) Generating more products by using more raw materials.
 - (d) A linear system of “take, make, dispose”.
- 1-f. Effective strategy to reduce food waste at home or in restaurants:(CO3, K2) 1
- (a) Buying large quantities of food in advance to avoid frequent trips
 - (b) Ignoring minor spoilage and discarding food only when fully rotten.
 - (c) Planning meals carefully, storing food properly, and reusing leftovers
 - (d) Biogas
- 1-g. Wind energy is generated using: (CO4,K2) 1
- (a) Turbines
 - (b) Generators
 - (c) Batteries
 - (d) Transformers
- 1-h. The renewable energy technology uses mirrors to concentrate sunlight onto a receiver to produce steam_____ (CO4, K2) 1
- (a) Solar photovoltaic (PV)
 - (b) Solar thermal
 - (c) Wind turbines
 - (d) Tidal energy
- 1-i. The primary focus of redesign efforts for the national electric power infrastructure is (CO5,K2) 1
- (a) Physical structure of the grid
 - (b) Intelligence of the grid
 - (c) Renewable energy production
 - (d) End-user consumption
- 1-j. The primary goal of using a mixture of renewable energy technologies to provide baseload power_____ (CO5,K2) 1
- (a) Eliminate the need for fossil fuelsD. Increase overall energy consumption
 - (b) Ensure continuous electricity supply
 - (c) Reduce greenhouse gas emissions
 - (d) Increase overall energy consumption
2. Attempt all parts:-
- 2.a. Define the concept of "environmental stewardship."(CO1,K2) 2
- 2.b. State two disadvantages of building integrated photovoltaics. (CO2,K2) 2
- 2.c. Explain why E-waste needs to be separated. (CO3,K2) 2
- 2.d. Discuss two environmental benefits of hydropower as a renewable energy source.(CO4,K2) 2

- 2.e. Interpret why are coal and nuclear plants often chosen for base load power generation.(CO5,K2) 2

SECTION-B 30

3. Attempt all parts:-

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

3.a.(i) Describe the concept of the disruptive technologies in sustainability. (CO1,K2) 6

3.a.(ii) Discuss the role of sustainable water management in environmental sustainability.(CO1, K2) 6

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

3.b.(i) Apply the concepts of input and output metrics to assess the environmental impact of a manufacturing process. Justify why is it necessary to consider both. (CO2,K3) 6

3.b.(ii) Identify two emerging renewable energy technologies that show promise for future energy production.(CO2,K2) 6

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

3.c.(i) Explain the environmental, economic, and social impacts of food waste generation and disposal. (CO3,K2) 6

3.c.(ii) Apply the concept of recycling efficiency to a specific material, such as plastic or metal. Explain how increasing recycling efficiency can reduce waste and save natural resources.(CO3,K3) 6

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

3.d.(i) Define solar collectors? Give their classification and compare them based on construction and area of application.(CO4, K3) 6

3.d.(ii) Describe utility-scale geothermal energy systems and explain how geothermal energy is harnessed for electricity generation.(CO4,K2) 6

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

3.e.(i) Analyze the role of base load energy in sustainable energy systems. Discuss how do different base load energy sources contribute to grid stability and reliability.(CO5, K4) 6

3.e.(ii) Discuss the role of transmission grids in the distribution of electricity and explain how they ensure reliable and efficient delivery from power plants to consumers.(CO5, K3) 6

SECTION-C 50

4. Answer any one of the following:-

4-a. Compare how sustainable urban planning strategies enhance city resilience to disruptions while improving overall livability for residents. (CO1,K3) 10

4-b. Explain the role of government policies and regulations in promoting sustainability.(CO1,K2) 10

5. Answer any one of the following:-

5-a. Explain multifunctional materials and its impact on sustainability in detail. Discuss its applications also. (CO2,K2) 10

5-b. Interpret why environmental metrics for lifecycle inputs and outputs matter in sustainability assessments. Describe examples and explain their role in decision-making. (CO2,K3) 10

6. Answer any one of the following:-

- 6-a. Apply the waste hierarchy concept to waste management planning and analyze its significance. Evaluate the effectiveness of various waste management strategies in real-world scenarios.(CO3, K4) 10
- 6-b. Explain the benefits and challenges of reuse and redistribution programs compared to traditional recycling and disposal methods. Discuss the potential for collaborative consumption, sharing economy models, and circular business strategies to promote resource efficiency and reduce waste generation.(CO3, K2) 10

7. Answer any one of the following:-

- 7-a. Explain the principle behind solar thermal electric power generation and compare it with photovoltaic solar power. Discuss the different types of solar thermal power plants. (CO4,K2) 10
- 7-b. Analyze the principle of wind energy conversion and apply knowledge of typical wind turbine components to a scenario. Differentiate advancements in wind turbine technology, such as offshore wind farms versus floating wind turbines.(CO4,K4) 10

8. Answer any one of the following:-

- 8-a. Examine the challenges associated with scaling up renewable energy deployment, including land use conflicts and permitting issues.(CO5,K4) 10
- 8-b. Explain the role of innovation and technology in advancing circular economy initiatives in the energy sector and driving sustainable development.(CO5,K2) 10