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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

M.Tech. (Integrated)

SEM: IX - THEORY EXAMINATION (2024 - 2025)

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. Sustainability is : [CO1,K1]

1

(a) Meeting the needs of the present without compromising the ability of future generations to meet their own needs.

(b) Maximizing profits in the short term.

(c) Exploiting resources without concern for the environment.

(d) None of the above.

1-b. 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-c. According to Werner and Souder, what is the key factor in choosing an appropriate measurement metric? [CO2,K2]

1

(a) Availability of data

(b) User's needs and purpose

(c) Area of study

(d) Data accessibility

1-d. Leading metrics primarily indicate: [CO2,K1]

1

(a) Current status

- (b) Future possibilities
- (c) Past events
- (d) Real-time data
- 1-e. Biomass energy is derived from: [CO3,K1] 1
  - (a) Fossil fuels
  - (b) Plant and animal matter
  - (c) Nuclear reactions
  - (d) Geothermal heat
- 1-f. Renewable energy source that generates electricity by utilizing the Earth's heat. [CO3,K2] 1
  - (a) Wind energy
  - (b) Solar energy
  - (c) Geothermal energy
  - (d) Biomass energy
- 1-g. The renewable energy source which is most commonly used for generating electricity in the United States is [CO4,K2] 1
  - (a) Solar energy
  - (b) Wind energy
  - (c) Biomass energy
  - (d) Hydropower
- 1-h. The renewable energy source which is most commonly used for heating water in residential and commercial buildings is [CO4,K2] 1
  - (a) Solar energy
  - (b) Wind energy
  - (c) Geothermal energy
  - (d) Biomass 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. Revenue Requirements (RR) measure is [CO5,K1] 1
  - (a) Operational efficiency
  - (b) Consumer demand
  - (c) Total revenue needed to cover project costs
  - (d) Renewable energy production

2. Attempt all parts:-

2.a.	Explain the concept of the "triple bottom line" in sustainability. [CO1,K2]	2
2.b.	Define Sustainability index. [CO2,K1]	2
2.c.	Explain why E-waste needs to be separated. [CO3,K2]	2
2.d.	Define geothermal energy systems.[CO4,K2]	2
2.e.	Name two non-renewable resources commonly used for base load power generation. [CO5,K1]	2

## **SECTION-B** 30

3. Answer any five of the following:-

3-a.	Describe the concept of the disruptive technologies in sustainability. [CO1,K1]	6
3-b.	Discuss the challenges associated with achieving sustainable consumption patterns.[CO1,K2]	6
3-c.	Define green chemistry. Discuss its principles also. [CO2,K1]	6
3-d.	Compare and contrast between input metrics and output metrics in environmental assessment. [CO2,K2]	6
3.e.	Describe the working of Solar photovoltaic systems.[CO3,K1]	6
3.f.	Name and discuss different renewable energy resources in detail. [CO4, K2]	6
3.g.	Discuss the benefits and challenges of sustainable transportation technologies in promoting environmental sustainability and reducing carbon emissions. [CO5,K2]	6

## **SECTION-C** 50

4. Answer any one of the following:-

4-a.	Outline the three pillars of sustainability and provide examples of each. [CO1,K1]	10
4-b.	Explain the difference between renewable and non-renewable resources and their significance for sustainability. [CO1,K2]	10

5. Answer any one of the following:-

5-a.	Evaluate the significance of environmental metrics, economic metrics, and social metrics in technology evaluation, discussing their interdependence and role in promoting sustainability. [CO2,K3]	10
5-b.	Elaborate embodied energy and its significance in sustainability analysis.[CO2,K2]	10

6. Answer any one of the following:-

6-a.	Discuss the environmental, economic, and social impacts of food waste generation and disposal. Explain "food waste hierarchy" and the importance of prevention, redistribution strategies in food waste management. [CO3,K2]	10
6-b.	Define open-loop and closed-loop recycling systems and compare their key characteristics, benefits, and limitations. Discuss the principles of circular economy also.[CO3,K3]	10

7. Answer any one of the following:-

7-a.	Discuss the challenges and opportunities in implementing BIPV systems in urban	10
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environments. Analyze the impact of BIPV on energy efficiency, architectural aesthetics, and overall building performance.[CO4,K4]

- 7-b. Discuss the evolution of wind energy technology from traditional windmills to modern wind turbines. Explain the key components of a wind turbine system and how wind energy is converted into electricity.[CO4,K2] 10

8. Answer any one of the following:-

- 8-a. Can renewable energy sources alone meet global energy demand? Evaluate the potential of renewables in addressing energy needs while considering challenges such as intermittency, grid integration, and energy storage.[CO5, K5] 10

- 8-b. Discuss sustainable community and mass transit technologies and their role in promoting sustainable urban development. Provide examples of innovative transit solutions that prioritize environmental sustainability and community well-being. [CO5,K2] 10

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