Roll No.												

PRESIDENCY UNIVERSITY

BENGALURU

End - Term Examinations – May / June 2026

Date: 25-05-2026 **Time:** 01:00pm – 04:00pm

School: SOE	**Program:** B. Tech (SOCSE)	
Course Code : CIV2001	**Course Name:** Sustainability Concepts in Engineering	
Semester: VI	**Max Marks**: 100	**Weightage**: 50%

CO - Levels	CO1	CO2	CO3	CO4	CO5	CO6
Marks	2	10	12	17	29	30

Instructions:

(i) Read all questions carefully and answer accordingly.

(ii) Do not write anything on the question paper other than roll number.

Part A

Answer ALL the Questions. Each question carries 2marks. **10Q x 2M=20M**

1.	Define intragenerational Equity.	**2 Marks**	**L1**	**CO1**
2.	What is the motive of the Basel Convention?	**2 Marks**	**L1**	**CO2**
3.	List any 4 Sustainable Development Goals.	**2 Marks**	**L1**	**CO2**
4.	What are the Aims of CDM?	**2 Marks**	**L1**	**CO2**
5.	List the challenges with Multilateral Environmental Agreements and protocols.	**2 Marks**	**L1**	**CO2**
6.	What are the Key Objectives of the Air Act, 1981?	**2 Marks**	**L1**	**CO2**
7.	Define Carbon Tax.	**2 Marks**	**L1**	**CO3**
8.	What is the purpose of ISO 9001?	**2 Marks**	**L1**	**CO4**
9.	Mention any two environmental benefits of biofuels.	**2 Marks**	**L1**	**CO5**
10.	List any two causes of the greenhouse effect.	**2 Marks**	**L1**	**CO5**

Part B

Answer the Questions. **Total Marks 80M**

<table>
<tr><td>11.</td><td>a.</td><td>Rahul, a farmer, cultivates maize, barley, and rice on his agricultural land and wants to estimate the ecological footprint of his farm based on this year's crop production.
This year, he harvested 3 tons of maize, 4.5 tons of barley, and 5 tons of rice.
The average yield of his farm is 9 tons/ha for maize, 11 tons/ha for barley, and 8 tons/ha for rice.
The yield factors are 1.30 gha/ha for maize, 1.25 gha/ha for barley, and 1.40 gha/ha for rice.
The equivalence factors are 2.30 gha/ha for maize, 2.10 gha/ha for barley, and 2.60 gha/ha for rice.
Calculate the total ecological footprint (in global hectares, gha) of Rahul's farm.</td><td>10 Marks</td><td>L3</td><td>CO3</td></tr>
<tr><td colspan="6">Or</td></tr>
<tr><td>12.</td><td>a.</td><td>Consider the following land pockets with varying productivity and sizes. Determine the equivalence factor for each of the given land pockets.
<table>
<tr><td>Land Pocket</td><td>A</td><td>B</td><td>C</td><td>D</td><td>E</td></tr>
<tr><td>Biological Productivity (ha)</td><td>15 ha</td><td>20 ha</td><td>8 ha</td><td>30 ha</td><td>12 ha</td></tr>
<tr><td>Size (Area) (m^2)</td><td>25,000 m^2</td><td>50,000 m^2</td><td>15,000 m^2</td><td>60,000 m^2</td><td>30,000 m^2</td></tr>
</table></td><td>10 Marks</td><td>L3</td><td>CO3</td></tr>
<tr><td>13.</td><td>a.</td><td>Explain the working of a fuel cell and its applications in sustainable development. Discuss its advantages and limitations.</td><td>10 Marks</td><td>L2</td><td>CO5</td></tr>
<tr><td colspan="6">Or</td></tr>
<tr><td>14.</td><td>a.</td><td>Explain in detail the difference between conventional and non-conventional energy sources. Give examples and discuss their advantages and limitations.</td><td>10 Marks</td><td>L2</td><td>CO5</td></tr>
<tr><td>15.</td><td>a.</td><td>Define Pollution Prevention (P2). Discuss key strategies for implementing pollution prevention in industries.</td><td>10 Marks</td><td>L2</td><td>CO6</td></tr>
<tr><td colspan="6">Or</td></tr>
<tr><td>16.</td><td>a.</td><td>Explain the principles of the Circular Economy. How does it differ from the traditional linear economy?</td><td>10 Marks</td><td>L2</td><td>CO6</td></tr>
<tr><td>17.</td><td>a.</td><td>An RCC beam has a total volume of 12 m^3. The initial design uses steel reinforcement equal to 2.2% of the beam volume.
Given:</td><td>15 Marks</td><td>L3</td><td>CO4</td></tr>
</table>

		Density of steel = 7850 kg/m^3 Density of concrete = 2400 kg/m^3 Embodied energy of steel = 20 MJ/kg Embodied energy of concrete = 1.2 MJ/kg (a) Calculate the total embodied energy of the beam for the original design. (b) If high-strength steel (Fe550) is used, the required steel volume reduces to 1.5% of the beam volume. Calculate the total embodied energy for the modified design. (c) Compute the percentage reduction in total embodied energy.			
		Or			
18.	**a.**	An RCC beam has a total volume of 15 m^3. In the initial design, steel reinforcement occupies 1.8% of the total beam volume. Given: Density of steel = 7850 kg/m^3 Density of concrete = 2450 kg/m^3 Embodied energy of steel = 19 MJ/kg Embodied energy of concrete = 1.1 MJ/kg (a) Determine the total embodied energy of the beam for the original design. (b) If the design is revised and steel reinforcement increases to 2.8%, calculate the new total embodied energy. (c) Find the percentage increase in embodied energy.	**15 Marks**	**L3**	**CO4**

19.	**a.**	Discuss various appropriate technologies for sustainable energy development in India.	**5 Marks**	**L2**	**CO5**
	b.	Explain how climate change poses a threat to sustainable development, and describe the types of adaptation in current and future climate regimes with suitable examples.	**10 Marks**	**L2**	**CO5**
		Or			
20.	**a.**	Discuss how solar energy contribute to sustainable energy solutions.	**5 Marks**	**L2**	**CO5**
	b.	Explain the concept of ocean energy. Describe tidal, wave, and ocean thermal energy conversion methods with their applications and benefits.	**10 Marks**	**L2**	**CO5**

21.	**a.**	Discuss **innovative strategies for E-waste management**. Highlight challenges and suggest sustainable solutions.	**10 Marks**	**L2**	**CO6**
	b.	What is **industrial symbiosis**? Explain with a detailed case study.	**10 Marks**	**L2**	**CO6**
		Or			
22.	**a.**	Explain the sources, impacts, and management techniques of plastic waste. Include recent innovations in plastic recycling.	**10 Marks**	**L2**	**CO6**
	b.	Define Industrial Ecology and explain how it contributes to sustainable industrial development.	**10 Marks**	**L2**	**CO6**