U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

July 2023 Semester End Main Examinations

Programme: B.E. **Semester: VIII**
Branch: Institutional Elective **Duration: 3 hrs.**
Course Code: 21CV8OESLA **Max Marks: 100**
Course: Sustainability and Lifecycle Assessment **Date: 06.07.2023**

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

				CO	PO	Marks
			UNIT - I			
1	a)	What is sustainable development? Explain bearable, viable, equitable and sustainable solutions using a venn diagram indicating the basic pillars of sustainability.		*CO1*	*PO3* *PO7*	**08**
	b)	The following data is given for different modes of transportation.		*CO1*	*PO3* *PO7*	**06**
		Vehicle type | Life span of the vehicle (years) | Initial Cost of the vehicle (Rs.) | Seating Capacity | Mileage (km/litre of fuel) | Fuel type | Emission rates (kg of CO2/litre of fuel) Type-1 | 15 | 19,00,000 | 7 | 12 | Petrol | 3.45 Type-2 | 12 | 23,00,000 | 7 | 10 | Diesel | 2.87 Type-3 | 12 | 16,00,000 | 7 | 15 | Petrol | 2.15 Type-4 | 11 | 14,00,000 | 5 | 14 | Diesel | 4.52 If the cost of the petrol and diesel are Rs.101 and Rs.95 respectively, suggest the better vehicle in terms of sustainability with proper reasons.				
	c)	List any six Sustainable Development Goals (SDGs) and state two targets for each.		*CO1*	*PO3* *PO7*	**06**
			UNIT - II			
2	a)	What are Eco-indicators? Explain the factors to be considered for designing a viable sustainable development indicator.		*CO1*	*PO3* *PO7*	**06**
	b)	What do you understand by the term "Eco-efficiency" and what are the important aspects of Eco-efficiency?		*CO1*	*PO3* *PO7*	**06**
	c)	What do you mean by integrated solid waste management? Explain the different methods of minimizing waste generation to promote sustainable development.		*CO1*	*PO3* *PO7*	**08**

			UNIT - III				
	3	a)	Explain the factors influencing Life Cycle Assessment (LCA) of materials and products.	*CO3*	*PO3* *PO7*	**07**
		b)	Differentiate between engineering properties and sustainable parameters	*CO3*	*PO3* *PO7*	**06**
		c)	Explain the different methods of estimating embodied energy and embodied carbon.	*CO3*	*PO3* *PO7*	**07**
			OR			
	4	a)	The inventory data collected for manufacturing of one tonne (unit) of cement from a cement industry as shown below in the table	*CO3*	*PO3* *PO7*	**07**

Process/stage	*Type of fuel used*	*Quantity*	*Unit*	*Energy conversion factor*	*Unit*	*CO_2 Emission conversion factor*	*Unit*
Raw material extraction stage	Diesel	4.36	kg/unit	35.56	MJ/kg	2.45	kg/kg
	Electricity	5.78	kWh/unit	11.22	MJ/kWh	0.92	kg/kWh
Transportation	Petrol	2.56	kg/unit	38.64	MJ/kg	2.72	kg/kg
Processing	Electricity	62.54	kWh/unit	11.22	MJ/kWh	0.92	kg/kWh
packing	Electricity	1.15	kWh/unit	11.22	MJ/kWh	0.92	kg/kWh

Estimate the total energy use and carbon dioxide emission for manufacturing of one tonne of cement.

	b)	List out the advantages and disadvantages of conventional and non-conventional sources of energy.	*CO3*	*PO3* *PO7*	**06**
	c)	What do you mean by energy conversion efficiency? Explain any three challenges faced by India in energy sector.	*CO3*	*PO3* *PO7*	**07**
		UNIT - IV			
5	a)	What is the purpose of Life Cycle Analysis (LCA)? Explain with a neat sketch the different stages of LCA.	*CO2*	*PO3* *PO7*	**08**
	b)	Discuss the benefits and limitations of LCA	*CO2*	*PO3* *PO7*	**06**
	c)	What do you mean by functional unit (FU)? Explain the goals of performing inventory analysis for LCA study.	*CO2*	*PO3* *PO7*	**06**
		OR			
6	a)	Explain with a neat sketch the different type of boundary conditions used in performing LCA	*CO2*	*PO3* *PO7*	**06**
	b)	If there is a sudden decision to remove all the vehicles from the road that fails to meet emission and safety norms and as a citizen	*CO2*	*PO3* *PO7*	**06**

			of that place, give your views on the enforced regulation with proper justification.			
		c)	Explain in detail the Life Cycle Assessment pattern for a cement industry.	*CO2*	*PO3* *PO7*	**08**
			UNIT - V			
	7	a)	What is Life Cycle Impact Assessment? Explain the key steps involved in performing Life Cycle Impact Assessment.	*CO3*	*PO3* *PO7*	**08**
		b)	Explain any three Impact Categories of Life Cycle Analysis.	*CO3*	*PO3* *PO7*	**06**
		c)	What do you mean by Eco-audit? With the help of a flow chart, explain the approach to be followed for the eco-design of products.	*CO3*	*PO3* *PO7*	**06**

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