APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Scheme for Valuation/Answer Key

Scheme of evaluation (marks in brackets) and answers of problems/key

FIRST SEMESTER B.TECH DEGREE EXAMINATION(S), MAY 2019

Course Code: BE103

Course Name: INTRODUCTION TO SUSTAINABLE ENGINEERING

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each set carries 5 marks.

			Marks
1	a1)	The three-pillar model of sustainability.	(2)
	a2)	The main motto of the Clean Development Mechanism (CDM) Recommendations of Kyoto protocol.	(3)
		OR	
	b1)	Explanation with an example for sustainable development.	(5)
2	a1)	Zero waste concept with a suitable example.	(2)
	a2)	Explanation with any one example for the concept of 3R's in solid waste management.	(3)
		OR	
	b1)	List any five recent effects of climate change.	(5)
3	a1)	Define Bio-mimicking with one example	(2)
	a2)	List the procedure of EIA in India.	(3)
		OR	
	b1)	Explanation with any one example for the steps of LCA.	(5)
4	a1)	List any two features of a sustainable habitat.	(2)
	a2)	Any three impacts of non-sustainable transportation system.	(3)
		OR	
	b1)	Explanation with two examples for a sustainable transport system by integrating road and water transport and assuring reliability.	(5)
5	a1)	Explanation for the use of biofuel in transportation sector to reduce the emission of greenhouse gases.	(2)
	a1)	Any three benefits eg: use of electric cars: reduces air pollution Solar panels : reduction in fuel consumption, wind mills: reduction in electricity consumption	(3)
		OR	
	b1)	The working of a solar power plant. Mention Cochin International Air port	(4) (1)
6	a1)	The role of renewable energy in the Kerala Context .	(2)
	a2)	Identify various sources of renewable energy in India and its suitability.	(3)

OR

	b1)	Pros and Cons with ideas	(5)
7	a1)	Any three points with sustainable development can be communicated	(2)
	a2)	Any three ways for the road transport can be made sustainable	(3)

OR

	b1)	Any five ideas and practices for promoting energy efficiency in the domestic sector.	(5)
8	a1)	List out any two common practices promoting energy efficiency	(2)
	a2)	Explain with a suitable example industrial symbiosis.	(3)

OR

	b1)	Any Five issues and its solution in a slum area	(5)

PART B

(Read the Stories/Cases/Data set as the case may be, and answer all questions, each full question carries 10 marks.)

Stories/Cases/Data set - 1

(Stories/Cases/Data set)

Shimla one of India's most popular summer retreats nearly ran out of water. The Himalayan city was the former summer capital of the British Raj and continues to be popular with Indians fleeing scorching summers on the Gangetic plain. Water supplies have been critically low for at least the past three years. Water channels in Shimla and its suburbs have dried up this summer owing to less snowfall in the past winter and less rains thereafter. The shortage has forced the city's 172,000 residents to line up for hours each day to collect water from tankers supplied by the government, to drink bottled water or to pay steep prices to the "tanker mafia".

Module I

9	a)	Identify any three reasons for the present situation of Shimla.	(3)
	b)	Impact on social, economic and environmental spheres with one marks each.	(3)
	c)	The reasons for water scarcity and Any two preventive measures to come out from the crisis.	(4)

Stories/Cases/Data set - 2

(Stories/Cases/Data set)

Kerala state with an area of 38,863 Sq. km is one of the densely populated regions of the world having limited land and non-renewable resource availability. On the other hand, increasing human requirements and economic developments impose immense pressure on the natural resource base. The hill as well as its soil apron has many beneficial natural functions. Soil is the end product of crustal weathering through thousands of years. It is the abode for many micro-organisms that are essential for maintaining fertility of the ecosystem. The surface and subsurface flow of water is sustained by the soil profile in a hill ecosystem. Therefore, indiscriminate soil quarrying will lead to irreparable damages to the living environment.

A study proposes the following measures, in case the quarrying is unavoidable. Soil quarrying, if permitted based on scientific studies, should be done under the strict vigilance and control as per the rules and regulations. The fertile top soil should be collected separately and used for refilling the area after completion of the quarrying process. Awareness campaign should be conducted among people about the various impacts of soil quarrying and levelling of hillocks, present state of hill ecosystems, finite character of the resource, use of alternative materials and immediate need for control measures.

Module II

10	a)	Yes/No-1 mark Justifiaction -2 marks.	(3)
	b)	Any three impacts of soil quarrying on the eco system	(3)
	c)	Yes/No-1 mark	(4)

Justifications by relevant points in resource degradation -3 marks.

Stories/Cases/Data set - 3

(Stories/Cases/Data set)

Water supply management systems are becoming increasingly complex and instrumented requiring a rich set of features to deal with the complexity efficiently. Automation and "smart" water management software centred around powerful dash boarding, background analytics, management through exception and codifying standard operating procedures can be a solution to this complexity. Such a system was proposed for Bangalore city supports customizable key performance indicators (KPIs), business rules for managing water flow, real time reporting on a rich geo-spatial visual. This provides pro-active alerts to commonly occurring disruptions and optimization such as pressure management to reduce energy bills or water loss from leakage. Real time data and continuously refinement of water flow equations provide higher levels of precision for water supply, audit and balance. The software could control actuators, pumps, valves to automate water operations with far greater precision.

Module III

11	a)	Link the case with Environment Management System,EIA analysis, Enegy auditing.	(3)
	b)	Design modified system relevant to an engineering college campus.	(3)
	c)	List the ISO certification procedures and reflection of the knowledge in ISO standards in the answer.	(4)

Stories/Cases/Data set - 4

(Stories/Cases/Data set)

Infosys, a global Consulting and Technology leader, has been awarded the LEED (Leadership in Energy and Environmental Design) India 'Platinum' rating by Indian Green Building Council (IGBC) for its Software Development Block 1 (SDB 1) at its Pocharam campus in Hyderabad.
Key features of this building include:
• **Water Efficiency:** 48% reduction in overall water consumption through the use of efficient plumbing fixtures and by water recycling. 100% of waste water from the campus will be treated on site, helping in the reduction of potable water consumption.
• **Energy Efficiency:** The building is 40% more efficient than the globally accepted ASHRAE standard. This has been achieved through an efficient building envelope including high performance glazing and adequate shading, radiant cooling system, efficient chillers, pumps and fans, efficient lighting system and smart building automation.
• **Day lighting:** Over 90% of the office space has natural light, reducing the need for artificial lighting during daytime. The design includes light shelves along all windows to ensure that the natural light travels as deep into the building as possible.
• **Efficient Material Selection and Management**: Recycled materials account for 18% of the total value of materials in the building; these include aluminium, glass, steel, plywood and tiles among others. 38% of the total project material by cost was manufactured regionally thereby reducing pollution due to transportation.

Module IV

12	a)	Any three points relevant to Energy efficiency	(3)
	b)	List any three methods adaptable to take care of a green building.	(3)
	c)	Steps involved in LEED Green Building Rating System of high performance green buildings.	(4)

Stories/Cases/Data set - 5

(Stories/Cases/Data set)

According to the study conducted by the International Energy Agency (IEA), petrochemicals are becoming the largest drivers of global oil demand, outperforming cars, planes and trucks. The petrochemicals- components derived from oil and gas that are used in products such as plastics, fertilisers, packaging, clothing, digital devices, medical equipment, detergents and tyres and modern energy systems like solar panels, wind turbines, batteries, thermal insulation and electric vehicles – have become an integral part of human life. Petrochemicals are one of the key blind spots in the global energy debate, especially given the influence they will exert on future energy trends. They will have a greater influence on the future of oil demand than cars, trucks and aviation. They provide substantial benefits to society, including a growing number of applications in various cutting edge, clean technologies critical to sustainable energy systems. However the production, use and disposal of petrochemical- derived products present a variety of climate, air

quality and water pollution challenges that need to be addressed. To address these challenges, a Clean Technology Scenario (CTS) which provides an alternative future in line with key UN Sustainable Development Goals such as climate action and responsible consumption. CTS recommends slashing air pollutants from primary chemicals production by almost 90% by 2050 and reducing direct CO2 emissions by 60% . It also suggests reducing water demand by 30%.

Module V

13	a)	Any five pollutions caused by petrochemical derived products .	(5)
	b)	Any five ways to reduce the emission of Greenhouse gases. Explanation with the benefits.	(5)

Stories/Cases/Data set - 6

(Stories/Cases/Data set)

Sponge City is the concept popular in China, a city that can hold clean, drain water in a natural way, using an ecological approach. It retains water for its own use. Permeable materials shall be replaced by grass and gardens to allow sustainable drainage. Cities should have separate rainwater from the sewer system, which enables the waste water treatment plants to function properly without being overburdened. Flood plains has to be restored, as they are absolutely necessary for flood protection; preventing all sorts of development activities. Illegal sand mining, rapid urbanisation leading to encroachment of water bodies, unplanned tourism and lack of proper administrative discipline facilitates the worries of generations on flooding.

Module VI

14	a)	Identify any five benefits expected from the concept “sponge city” and explanation.	(5)
	b)	Any three application and practices in Indian context with relevant points of industrial ecosystem.	(5)

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