

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
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) | Illustrate the three-pillar model of sustainability. | (2) |
| | a2) | What is the main motto of the Clean Development Mechanism (CDM)? Relate the same to the suggestions of Kyoto protocol. | (3) |
| OR | | | |
| | b1) | Using a suitable example explain how technological progress can play a critical role in sustainable development. | (5) |
| 2 | a1) | Briefly describe zero waste concept with a suitable example. | (2) |
| | a2) | Using any one example illustrate the concept of 3R's in solid waste management. | (3) |
| OR | | | |
| | b1) | "No Challenge poses a greater threat to future generation than climate change"- Barack Obama. Enumerate the recent effects of climate change. | (5) |
| 3 | a1) | What is Bio-mimicking? | (2) |
| | a2) | List out the procedures of EIA followed in India. | (3) |
| OR | | | |
| | b1) | Life cycle assessment takes the concept of "cradle to grave". Explain this with any example. | (5) |
| 4 | a1) | Enumerate the basic features of a sustainable habitat. | (2) |
| | a2) | What are the impacts of non-sustainable transportation system? | (3) |
| OR | | | |
| | b1) | What are your proposals for a sustainable transport system by integrating road and water transport? | (5) |
| 5 | a1) | The acceptance of biofuel in transportation sector can reduce the emission of greenhouse gases. How? | (2) |
| | a2) | The production of renewable as well as non-renewable energy has carbon foot print. Then why we are promoting renewable energy? | (3) |
| OR | | | |
| | b1) | Explain in detail, the working of a solar power plant associated with an airport in Kerala. | (5) |
| 6 | a1) | Critically analyse the role of renewable energy in the Kerala Context. | (2) |
| | a2) | Compare the feasibility of various sources of renewable energy that can be tapped with special reference to India. | (3) |

OR

- b1) During the recent floods in Kerala, we heard a statement that the dams in Kerala would be reduced to 'tourist attractions' within 50 years, because alternate energy may replace the hydroelectric power plants. Compare the pros and cons on the idea conveyed in this statement? (5)
- 7 a1) How can sustainable development be communicated successfully? (2)
- a2) How the road transport can be made sustainable? (3)

OR

- b1) How can you promote energy efficiency in the domestic sector? (5)
- 8 a1) List out some common practices followed in the construction industry, in Kerala promoting energy efficiency. (2)
- a2) Explain industrial symbiosis with a suitable example. (3)

OR

- b1) How the typical problems in a slum area can be tackled? (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 - I

(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) What are the possible reasons for the present situation of Shimla? (3)
- b) What are the impacts on social, economic and environmental spheres? (3)
- c) "The water scarcity problem of Shimla is a clear violation of the goal of sustainability." Substantiate the statement. Suggest 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) Can we stop the soil quarrying from hills? Justify your arguments. (3)
- b) What are the impacts of soil quarrying on the eco system? (3)
- c) Can such local environmental issue be an example also for resource degradation? Justify. (4)

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 on 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) Describe the given case as an Environment Management System. (3)
- b) Propose a modified system to your campus. (3)
- c) List steps to get an ISO certification to your proposal. (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) Energy efficiency has been given more weightage in the rating systems than all other aspects. Justify this. (3)
- b) What are the additional aspects (than given in the case) to take care for a green building. (3)
- c) How LEED Green Building Rating System can function as a benchmark for design, construction and operation 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) How petrochemical derived products influence pollution? (5)
- b) Suggest ways to reduce the emission of Greenhouse gases. How each option benefits the environment? (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) What benefits are expected from the concept “sponge city”? (5)
- b) How this concept can be applied in Indian context. (5)
