

Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
**FIRST SEMESTER B.TECH DEGREE EXAMINATION(S), DECEMBER 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) Comment on the challenges for sustainable development in our country and suggest a way to overcome the same. (2)
- a2) Enumerate the major intentions of the Air Act. (3)

**OR**

- b1) Explain the role played by communication and information technology in achieving sustainable development. (5)
- 2 a1) A massive campaign on environmental degradation is to be initiated. Bring out a slogan and the key message that need to be addressed. (5)

**OR**

- b1) "Think Global, Act Local" .Substantiate the statement in the context of reducing one's own carbon footprint. (5)
- 3 a1) What is Life Cycle Analysis (LCA)? (2)
- a2) Justify the need of LCA. (3)

**OR**

- b1) Explain the role played by ISO 14000 towards ensuring sustainability in industrial operations. (5)
- 4 a1) Explain how energy efficiency is obtained in traditional Nalukettu. (2)
- a2) Write a short note on LEED rated buildings. (3)

**OR**

- b1) What are the methods for increasing energy efficiency of buildings? (5)
- 5 a1) What are limitations in harnessing the tidal energy? (2)
- a2) Being an agriculture country, what is the scope of using bio-fuels for meeting the energy needs of India? (3)

**OR**

- b1) List out the advantages and disadvantages of non-conventional sources of energy. (5)
- 6 a1) What is the scope of using geothermal energy as a non-renewable energy source? (2)
- a2) Give suggestions to reduce the power consumption at the place where you are studying, enumerating the unwanted/ wastage of power. (3)

**OR**

- b1) Explain in detail, the working of any one type of fuel cell. (5)

- 7 a1) 'Are social and technological changes needed for making a sustainable society'; Justify your answer (2)
- a2) What is the concept of industrial ecology? Give an example of a recent product. (3)

**OR**

- b1) Why "Pollution prevention" is always better than "pollution reduction"? (5)
- 8 a1) Draw the layout of an industrial park in which industries are selected such that the wastes or byproducts of one become the raw materials for another. (2)
- a2) Mention both the product and by-product/waste of each industry and how they are useful to another industry or industries (3)

**OR**

- b1) 'People move to cities to get better quality of life'; Is this statement correct? Substantiate your answer with minimum 5 reasons. (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)

CDM project in Kolar District, India Providing rural households with low-cost energy services  
The Bagepalli CDM Biogas Project involves the construction of approximately 5,500 two-cubic-metre capacity biogas digesters in households in the area ("Taluk") of Bagepalli and other nearby Taluks in the Kolar District, Karnataka, India. The digesters, which utilise the dung of household cows, produce methane gas from the anaerobic breakdown of organic waste. The resulting methane is used as a cooking fuel in biogas stoves built in the dwellings. This replaces inefficient wood-burning mud stoves that were traditionally used for cooking and to produce hot water. It is a particularly critical technology for the area because of widespread deforestation due to firewood collection, and increasing shortages of wood for fuel in the area. An average dwelling has five occupants, meaning that nearly 30,000 people will benefit from the scheme.

**Module I**

- 9 a) What are the main objectives of CDM? (3)
- b) In connection with CDM, explain carbon credit. (3)
- c) Elucidate the benefits of the project in terms of three pillars of sustainability. (4)

**Stories/Cases/Data set - 2**

(Stories/Cases/Data set)

Improper Municipal Solid Waste (MSW) disposal and management causes all types of pollution: air, soil, and water. Indiscriminate dumping of wastes contaminates surface and ground water supplies. In urban areas, MSW clogs drains, creating stagnant water for insect breeding and floods during rainy seasons. Uncontrolled burning of MSW and improper incineration contributes significantly to urban air pollution. Greenhouse gases are generated from the decomposition of organic wastes in landfills, and untreated leachate pollutes surrounding soil and water bodies. Health and safety issues also arise from improper MSW Management. Insect and rodent vectors are attracted to the waste and can spread diseases such as cholera and dengue fever. Using water polluted by MSW for bathing, food, irrigation and drinking water can also expose individuals to disease organisms and other contaminants. The U.S. Public Health Service identified 22 human diseases that are linked to improper MSWM. Waste worker and pickers in

developing countries are seldom protected from direct contact and injury, and the co-disposal of hazardous and medical wastes with MSW poses serious health threat. Exhaust fumes from waste collection vehicles, dust stemming from disposal practices and the open burning of waste also contribute to overall health problems. People know that poor sanitation affects their health, especially in developing and low-income countries, where the people are the most willing to pay for environmental improvements.

### **Module II**

- 10 a) Explain the Zero waste concepts. (3)  
b) Enumerate the causes of air, water and soil pollution from MSW. (3)  
c) What can be done to minimize the adverse health impacts and environment degradation due to MSW? (4)

#### **Stories/Cases/Data set - 3**

(Stories/Cases/Data set)

We outline a path to sustainable development that would give future generations the chance to be as well-off as their predecessors without running out of natural resources, especially metals. To this end, we have to consider three key resources: (1) the geosphere or primary resources, (2) the technosphere or secondary resources, which can be recycled and (3) human ingenuity and creativity. We have two resource extremes: natural resources which are completely consumed (fossil fuels) versus natural resources (metals) which are wholly recyclable and can be used again. Metals survive use and are merely transferred from the geosphere to the technosphere. There will, however, always be a need for contributions from the geosphere to offset inevitable metal losses in the technosphere. But we do have a choice. We do not need raw materials as such, only the intrinsic property of a material that enables it to fulfil a function. At the time when consumption starts to level off, chances improve of obtaining most of the material for our industrial requirements from the technosphere. Then favourable supply equilibrium can emerge. Essential conditions for taking advantage of this opportunity: affordable energy and ingenuity to find new solutions for functions, to optimize processes and to minimize losses in the technosphere.

### **Module III**

- 11 a) What are the key resources mentioned that will bring about sustainable development. (3)  
b) What are the challenges for bringing out sustainable development through recycling process? (3)  
c) Explain any three methods to attain the equilibrium. (4)

#### **Stories/Cases/Data set - 4**

(Stories/Cases/Data set)

Housing, being the very basic requirement that holds the key to accelerate social development in many ways, the Government of Kerala launched a Mission named LIFE (Livelihood Inclusion and Financial Empowerment) which envisages a comprehensive housing scheme for all the landless and homeless in Kerala State. The target of the mission is to provide safe housing to nearly 4.30 lakhs of homeless in the State within a period of 5 years. Also, the homeless will be provided with provision for pursuing their livelihoods, converging social services including Primary Health Care, Geriatric Supports, Skill Development and provision for financial services inclusion. Priority will be given to coastal population, plantation workers and those who stay in temporary shelters in government lands.

**Module IV**

- 12 a) Propose sustainable habitat principles for the mission (3)  
 b) List the possible barriers to the mission (3)  
 c) Analyse the mission from social, economic, and environmental sustainability perspective. (4)

**Stories/Cases/Data set - 5**

(Stories/Cases/Data set)

Wind turbines, designed as an alternative to fossil fuels, contributes to climate change due to the way they redistribute heat and moisture in the atmosphere. A research at Harvard University found that powering US with wind energy would cause a 0.54° C ground temperature rise in the area where the turbines were located and 0.24°C increase across the continental US; which means the impacts of wind energy are not negligible. The turbines bring the warm air down and cool air up, making the ground hotter, during night. The average global temperature has risen by approximately 10°C by the end of the 19th Century. The impact on climate change from greenhouse gas emissions are a bigger threat globally over the turbine caused warming; which is temporary and stops when the blades are not turning. The Paris Climate Accord calls upon countries to limit temperature increase between 1.5°C to 20°C to avoid serious environmental consequences. The study also says that installing solar panels would have an impact around times smaller than wind turbines for the same energy generation rate. The direct climate impacts of wind power are instant, while the benefits accumulate slowly. The Wind power is enormously cleaner than coal or gas, if the perspective is for the next thousand years, but for short term perspective, it is having more impact than coal or gas.

**Module V**

- 13 a) What are the different alternatives for Fossil fuels? Compare the impact of Solar and wind energy on climate change (5)  
 b) “The average global temperature has risen by approximately 10°C by the end of the 19<sup>th</sup> Century”. Enumerate the causes of the temperature rise. (5)

**Stories/Cases/Data set - 6**

Wetlands, especially peatlands, are the biggest store of carbon on land. They are among the most diverse and productive ecosystems. They provide essential services and supply all our fresh water. The draining and degradation of wetlands turn them into a source of greenhouse gas emissions. The restoration of damaged wetlands can halt emissions of carbon di oxide and even reverse them, causing carbon removal from the atmosphere. Even as more wetland and coastal areas are reclaimed in the name of development, palaeontologists have excavated evidence of evergreen forests that were submerged in swamps, marshes and coastlands of Kerala. These lands are one of the best carbon sinks in India.

**Module VI**

- 14 a) How restoration of wetlands, improves the ecology of earth? (5)  
 b) How carbon is being stored by nature, preventing harm to the inhabitants (5)

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