

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

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

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
B.Tech Degree S1,S2(S,FE) Examination May 2021(2015 Scheme)

**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) What is the stand of India in Kyoto protocol? (2)  
a2) What are the key features of MEA? (3)

**OR**

- b1) List any two environmental legislation related bodies in India along with their responsibilities. (2)  
State the importance of environmental legislations in India. (3)
- 2 a1) Many parts of Kumarakom lake are covered with algae and the water is green in colour. Plastic and other wastes are also found on surface and people are not able to approach the pond due to foul smell. Often dead fishes are found on the surface with the wastes. What might be the factors that contributed to the present condition of the pond? (2)  
a2) What measures can be adopted to restore the pond? (3)

**OR**

- b) What is meant by 3R concept of waste management, citing two examples? (5)
- 3 a1) List out the benefits for a building construction company by implementing Environment Management System (EMS). (5)

**OR**

- b1) Biomimicking can be an appropriate way for identifying pathways for sustainable development - justify the statement using two suitable examples. (5)
- 4 a1) Propose methods to promote public transport systems than individual vehicles. (5)

**OR**

- b1) List any 5 criteria of selection of materials in a sustainable design. (5)
- 5 a1) Write about the scope of starting a power plant in Kerala to derive electrical energy from tides. (2)  
a2) Explain in detail, the working of any one type of fuel cell. (3)

**OR**

- b1) "Kerala should avoid constructing large dams and instead should install small hydro plants". What is the impact of large dam on environment? Enumerate the possible benefits of installing smaller hydro plants. 5

- 6 a1) What are limitations in harnessing the tidal energy? (2)  
a2) Write down the scope of wind mills in Kerala? (3)

**OR**

- b1) List out the advantages and disadvantages of conventional sources of energy. (5)  
7 a1) Describe the role of urbanisation towards water scarcity (2)  
a2) What are the characteristics of a sustainable city? (3)

**OR**

- b1) Incorporating sustainability concepts in our activities add value to any business. What concepts you wish to consider or keep in mind while starting a business venture? (5)  
8 a1) What are the push - pull factors affecting rural-urban migration? (2)  
a2) How industries can make profit, by reducing the carbon foot print? (3)

**OR**

- b1) Write down any five principles of green engineering. (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)

Indian researchers have developed a new reusable composite material made out of rare earth oxide, Ceria, which in the presence of sunlight can purify the rivers flowing with polluted water. The Ceria based nano materials developed by them can effectively degrade microbes and chemical dyes in water due to their superior photo-catalytic activity. The E Coli bacteria forming units per millilitre was reduced from 200 million units to less than 100 units in 80 minutes when exposed to visible light. The compound was able to remain stable even after several cycles of usage with polluted waters.

**Module I**

- 9 a) Identify the novel approach proposed, for the sustainability of river water (3)  
b) What are the major issues faced by our water bodies? (3)  
c) Can this new technique be a solution for solving the scarcity of drinking water? (4)

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

(Stories/Cases/Data set)

The worst flood affected in Kerala was in August 2018. This was due to the unusually high rainfall during the monsoon season. About 500 people died, and many were missing. At least a million people were evacuated. All 14 districts of the state were placed on red alert. Most of the dams within the state were opened for the first time in the history. Heavy rains in Wayanad and Idukki have caused severe landslides and have left the hilly districts isolated. According to the Kerala government, one-sixth of the total population of Kerala had been directly affected by the floods and flood-related incidents.

**Module II**

- 10 a) In your opinion is there a phenomenon called climate change? Substantiate (3)  
your answer.
- b) What are the other incidences that you have observed recently by which you (3)  
can state that there is climate change globally?
- c) How the over-exploitation of natural resources had worsened the impact of (4)  
monsoon in the state?

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

(Stories/Cases/Data set)

Times change. Raw materials are becoming scarcer, emissions are on the increase and many cultures in various parts of the world are undergoing major changes. Against this backdrop, careful use of resources is gaining in importance all the time. Audi is helping to make this change – true to the technical leadership implied in its classic motto 'Vorsprung durch Technik'. Modern technologies, new materials and highly efficient components are available to optimise vehicle design. For Audi, as a pioneer in vehicle development, progress in the careful use of non-renewable resources is a task that involves every area of its activities. Life cycle assessments (LCA) are important procedures that can help to reduce the motor vehicle's impact on the environment. Audi not only assesses the vehicle while it is in use, which mainly concerns its fuel consumption, but the entire life cycle from production to recycling. Audi looks one step ahead. The life cycle assessment analyses the effects of a product on the environment during its entire existence, from production to its period of use and its end-of-life recycling. It is a quantitative evaluation of ecological aspects such as the emission of greenhouse gases (including carbon dioxide [CO<sub>2</sub>]), energy consumption, acidification or 'summer smog'. Audi compiles its life cycle assessments according to the procedure laid down in the international ISO 14040 series of standards.

**Development phase:** assessment of materials and semi-finished product manufacturing chains

**Production phase:** assessment of components and complete vehicles

**Use phase:** assessment of fuel/electricity (including production)

**Recycling phase:** assessment of process chains of valuable materials

**Module III**

- 11 a) Prepare a life cycle analysis for automobiles. (3)
- b) Elaborate on the results of life cycle inventory analysis. (3)
- c) What are the major phases of AUDI on which the LCA is laid down and their (4)  
impact parameters?

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

(Stories/Cases/Data set)

Sustainable architecture and green design have become one of the most widespread areas of focus in the scholarly studies related to build environments. Accordingly, with view to the environmental assessment and energy performance of buildings, it is vital to develop an overview of current theoretical perspectives, trends, applications and constraints towards the development of green environmentally sustainable buildings. To confirm that, previous studies put forward a theory representing that the performance of green buildings is substantially related to the level of their environmental assessment, thus, versatile studies highlight the necessity of the identification

and consideration of sustainable energy performance indicators in the environmental evaluation and any green implementations. In this regard, the building energy efficiency, the thermal performance of buildings and the material efficiency are considered as significant parameters of sustainable energy performance indicators to be fully taken into consideration during the performance evaluations. According to the study by Joelson , with view to the effectiveness of green buildings towards decreasing the use of energy and its negative impacts on the environment, there are fundamental strategies including ‘reducing the energy demands’, ‘enhanced energy efficiency’ and ‘application of passive design techniques’. Likewise, the utilization of appropriate building envelopes is influential in more than half of the embodied energy distribution in a building, particularly in residential buildings.

#### **Module IV**

- 12 a) Explain how green buildings can reduce energy use and solid waste. (3)  
b) How Government can support its citizen to promote green building concept? (3)  
c) Illustrate some renewable energy applications in a green building. (4)

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

(Stories/Cases/Data set)

In the green energy initiative, Tamil Nadu is a leader among all states. TANGEDCO/TNEB harnessed 13,000 million units of wind energy and 2,905 million units of solar energy in 2017-18. Tamil Nadu is the only state to have used so much of green energy last year, thereby saving not less than 5,406 million tonnes of carbon on this account. They proposed to enhance wind power capacity to the total capacity of 9500 MW by the end of 2018. This act had lowered the power purchase as well. Besides this, old transformers across state have been upgraded or set up newly, improving power quality.

#### **Module V**

- 13 a) What are the different alternate sources of energy that Kerala can opt for? (5)  
What drawbacks we can expect in depending on wind energy alone for a state?  
b) How the green energy initiative from Tamil Nadu can improve the quality of (5)  
environment to ensure a cleaner and safer energy?

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

(Stories/Cases/Data set)

At least 300 million of India’s 1.25 billion people live without electricity. Another quarter-billion or so get only spotty power. The lack of power affects rural and urban areas alike, limiting efforts to advance both living standards and the country’s manufacturing sector. Prime Minister of India has made universal access to electricity a key part of the administration’s ambitions. India has promised to increase its renewable-energy capacity to 175 gigawatts, including 100 gigawatts of solar, by 2022. (That’s about the total power generation capacity of Germany.) At the same time, India has pledged to help lead international efforts to limit the ill effects of climate change. And this is India’s energy dilemma.

Already the world’s third-largest emitter of carbon dioxide and other greenhouse gases, India is attempting to do something no nation has ever done: build a modern industrialized economy, and bring light and power to its entire population, without dramatically increasing carbon emissions. Simply to keep up with rising demand for electricity, it must add around 15 gigawatts each year over the next 30 years. The country now gets most of its electricity from aging, dirty coal-fired plants. By 2050, India will have roughly 20 percent of the world’s population. If people of India

rely heavily on fossil fuels such as coal to expand the economy and raise their living standards to the level people in the rich world have enjoyed for the last 50 years, the result will be a climate catastrophe regardless of anything the present developed countries do to decrease its emissions

**Module VI**

- 14 a) How an industrial ecology approach will reduce the environmental impact of conventional industries of India? (5)
- b) What type of industrialisation do you propose for current India? Can India adopt the Industrial symbiosis concept here? (5)

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