

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIRST SEMESTER B.TECH DEGREE EXAMINATION, JULY 2018

Course Code: BE103

Course Name: INTRODUCTION TO SUSTAINABLE ENGINEERING

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 5 marks

Marks

- 1 a) Enlist the major challenges in the path of sustainable development. (5)
OR
b) Which are the comprehensive (special) environmental laws enacted by the Central Government in India after 1970. (5)
- 2 a) How far the 3R, 4R and 5R principles can be utilised for zero waste management. (5)
OR
b) Give the list of important activities that can reduce carbon footprint. Which is the ideal one for Kerala? Why? (5)
- 3 a) What are the benefits gained by an organisation in implementing Environmental Management System? (5)
OR
b) What is biomimicry? Give any three examples in the transportation sector, clearly stating the species and invention. (5)
- 4 a) How resource efficiency is achieved through material selection for a sustainable building design? (5)
OR
b) The existing transportation system in our country cannot be considered as a sustainable one? How it can be made sustainable? Give your suggestions. (5)
- 5 a) Differentiate between conventional and non-conventional sources of energy. (5)
OR
b) How can oceans be utilised for tapping energy? Discuss. (5)
- 6 a) What are the methods to convert biomass to energy without heating it? (5)
OR
b) List the various ways to conserve energy. (5)
- 7 a) Give the principles of green engineering for the design of products, processes and systems. (5)
OR
b) How will you relate industrial ecology principles to sustainable engineering? (5)
- 8 a) Which are the push and pull factors causing migration of people from rural to urban areas? (5)
OR
b) For any industry, material selection is very important. Why? (5)

PART B

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

Case – 1

Bangladesh Position on MEA's (Multilateral Environmental Agreements)

After independence, Bangladesh got recognition by different world fora like United Nations(UN), OIC etc. Membership of all those world fora helps Bangladesh to attend different environmental conferences from very beginning. The major conferences include: CBD, UNFCCC, ODS, UNCED, Kyoto protocol, Stockholm Convention etc. Bangladesh has

also led different environment for a for several times. In Bangladesh, Ministry of Environment and Forest(MOEF) is the designated Ministry to undertake national actions under these Conventions & Protocols and also to take part in international meetings and negotiations.

Module I

- 9 a) What are the key features of MEA? (3)
b) What would have been the motive for Bangladesh to participate in MEAs (2)
c) What is Kyoto protocol aimed at? (2)
d) What is Annexe I and Annexe II Countries and what is their role in reducing carbon emissions at global level? (3)

Case - 2

Mathura Refinery: Eating away history

As one approaches the city of Agra, one can see the haze that looms over the horizon, providing a shimmering quality to the old monuments that dot the city of Taj. The haze is killing the Mughal monuments and ancient temples at an alarming rate. The historical monuments in Agra-Mathura-Bharatpur region are directly in the line of the deadly Sulphuric dioxide (SO₂), which mixes with water vapour to form Sulphuric acid (H₂SO₄) showers. This acid reacts with marble and sandstone, the main building materials in most of the Mughal monuments and temples, silently eroding history away. The pollutants emitted by the refinery has also started showing its effects on flora and fauna of the Bharatpur Bird Sanctuary which was declared a World Heritage Site in the year 1985. But now for the past few years, the trees in the park have started falling, and whenever it rains in the region, small ponds have a yellowish layer on it.

Module II

- 10 a) Suggest any sustainable in-situ treatment for the water of Bharatpur Bird Sanctuary. (3)
b) What is haze? What is its impact on environment? (2)
c) What is the action of SO₂ on marble and sand stones? (2)
d) Suggest some methods to control the emission of gaseous pollutants to atmosphere (3)

Case - 3

ACC cement plant is situated in Nandini, Bhilai, Chhattisgarh state, India, in industrial area. It is providing quality product and excellent service. It has ISO 14000 certification and ISO 9002 quality system. It continues to promote various environmental performance initiatives in its own facilities viz. reduce dust emission, create a healthy environment, plantation and also reduce electricity consumption. It also recognizes the importance of social responsibility as a part of its overall commitment to sustainable development. Therein, perform the following activities: maintain a mini hospital to provide medical services, donations, education and development. The ACC plant consists of several units from limestone crushers to packing plants. Crusher unit comes under the main processing unit. Crusher department is one of the major sources of environmental pollution. Fugitive dust emission, stack emission and noise have been identified as significant aspects during activities like receipt of limestone, primary crushing, screening. These significant aspects are imparting very much impact on the human health like respiratory disorders, hearing impairment, etc. Thus there arises a need for developing a strategy for reducing the impacts and this require more attention to be emphasized on the aspects.

Module III

- 11 a) Give the list of ISO 14000 series for life cycle assessment. (3)
b) What are the initiatives taken by ACC to improve the environmental quality? (3)
c) List the common formal methods used for impact identification and analyses of significance of impacts. (2)
d) Develop a strategy for reducing the impacts listed for ACC. (2)

Case - 4

A beginning of the Green Building movement in India

The CII-Sohrabji Godrej Green Business Centre (CII-Godrej GBC) is a unique and successful model of public-private partnership between the Government of Andhra Pradesh, Pirojsha Godrej Foundation and the Confederation of Indian Industry (CII), with the technical support of USAID. The 1858m² building consists of an office building, a seminar hall and a Green Technology Centre, displaying the latest and emerging green building materials and technologies in India. The building was the first LEED Platinum-rated building for New Construction (NC) outside of the US and a large number of visitors tour the building to view its green features annually. According to the Indian Green Building Council, the CII-Godrej GBC building "marked the beginning of the Green Building movement in India". 80% of the materials used in the building were sourced within 500 miles from the project site. Most of the construction material contains post-consumer and industrial waste as a raw material during the manufacturing process. Fly-ash based bricks, glass, aluminium and ceramic tiles, which have post-consumer and industrial waste were used in constructing the building to encourage usage of recycled content. Office furniture is made of bagasse-based composite wood. More than 50% of the construction waste was recycled within the building or sent to other sites and diverted from landfill. As the first well-publicized green commercial building in India, the incremental cost was 18% higher than a conventional building. However, the Indian Green Building Council asserts that green buildings are now being delivered at an incremental cost of 6-8% in India and this initial incremental cost usually gets paid back in 3 to 4 years.

Module IV

- 12 a) Which are the three primary green building rating systems in India? (3)
- b) Name the post-consumer and industrial waste materials used for the construction of CII-Godrej GBC building (2)
- c) What are the benefits achieved when recycled materials used for construction? (2)
- d) Green buildings cost more than traditional buildings. Is it true for the CII-Godrej GBC building during its operative stage? (3)

Case - 5

World's Largest Solar Steam Cooking System at Tirumala, Andhra

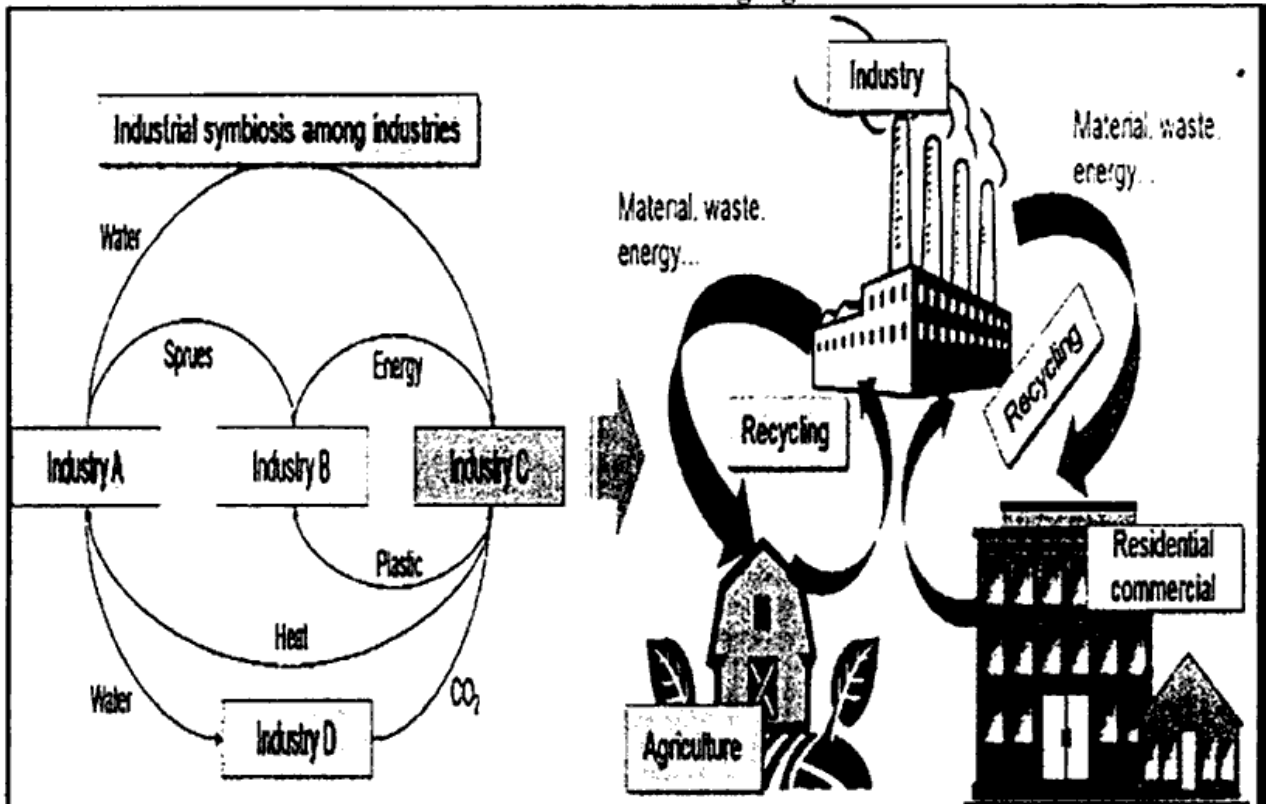
The world's largest solar steam cooking system has been installed by the Tirumala Tirupathi Devasthanam (TTD) at Tirupathi in Andhra Pradesh. The system has a capacity to prepare food for 15,000 people/day and employs automatic tracking solar dish concentrators, which convert water into high pressure steam. The steam thus generated is being used for cooking purposes in the kitchen of TTD. It has been hooked up with the existing boiler working on diesel so as to make the system reliable under all climatic conditions. The system has been designed to generate over 4000 kgs of steam/day at 180^oC and 10 kg/sq.cm which is sufficient to cook two meals for around 15,000 persons. It is modular in nature and consists of 106 automatic tracked parabolic concentrators arranged in series and parallel combination, each of 9.2 sq. meter reflector area. Each unit of concentrators is connected to a central steam pipeline going to the kitchen. The system is made of indigenous components and the reflectors are of acrylic mirrors having reflectivity over 75%. Its installation was completed during September 2002 and was inaugurated on 11th October 2002. The system is expected to save around 1,18,000 litres of diesel per year, valued at Rs. 2.3 million. <http://www.ktuonline.com>

Module V

- 13 a) What type of solar technology is adopted at TTD? (2)
- b) Give the features of the solar units used at TTD. (2)
- c) What are the social, economical and environmental advantages gained through the utilisation of solar energy? (3)
- d) Show a schematic diagram of the solar units and the generation of steam that have been provided at TTD. (3)

Case - 6

Consider the following figure



Module VI

- 14 a) Bring out the concept of symbiosis between industries A, B, C & D (3)
- b) How the industrial waste can be made use of in agriculture. (2)
- c) "Waste is a resource at the wrong place". Justify. (3)
- d) Explain the methods of controlling industrial emissions here. (2)

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