Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST SEMESTER B.TECH DEGREE EXAMINATION, APRIL 2018

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)	Give an example of any activity where sustainability and technology go hand in hand.	(2)
	a2)	Write a short note on multilateral agreements with examples.	(3)
		OR	
	b)	CDM is a good tool that can be used by developing countries for boosting up their own development. How?	(5)
2	a1)	Distinguish between carbon credits and carbon trading.	(3)
	a2)	List out any two methods by which carbon foot print can be reduced.	(2)
		OR	
	b)	How would you take initiatives in conducting your college fest, so that it remains an environmentally sustainable one?	(5)
3	a1)	Discuss the benefits of doing an EIA study.	(2)
	a2)	List down any six impacts considered in EIA.	(3)
		OR	
	b1)	Write a short note on EMS.	(2)
	b2)	Briefly indicate the steps involved in introducing EMS in an industry.	(3)
4	a)	Introduction of metro service in Kochi is a major achievement for the transportation system of the city. Do you think this can be related to sustainable engineering? If so, explain.	(5)
		OR	
	b)	Write a short note on how appropriate material selection can contribute in achieving sustainability in building construction.	(5)
5	a)	Suggest few measures by which usage of energy can be reduced in residential buildings.	(5)
		OR	
	b)	List the different types of renewable energy sources	(5)
6	a)	Explain hybrid power systems with examples.	(5)
		OR	
	b)	Discuss the advantages and disadvantages of nuclear energy.	(5)
7	a)	With a suitable example, explain the principles of industrial symbiosis.	(5)
		OR	
	b)	How can the industrial sector achieve a sustainable growth through the concept of industrial ecology?	(5)
8	a)	Discuss any three benefits of green engineering.	(5)

OR

b) List down the tools that can be used for pollution reduction in industries. Explain in detail any two of them. (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

Environmental ethics considers the ethical relationship between people and the natural world and the kind of decisions people have to make about the environment. Most people recognise that our planet is in a bad way and we all seem to have an opinion on environmental issues, such as climate change or the use of four wheel drive cars in cities. There has been a rapid growth in knowledge and technology, so that humans now face choices we have never had to face before that affect the continuation of humanity and the world within which we live. Environmental ethics simply tries to answer the questions of how humans should relate to their environment, how we should use the earth's resources and how we should treat other species, both plant and animal.

Module I

9 a) How is people and nature related to each other? (4)

b) "*Most people recognise that our planet is in a bad way...*" . Give examples of any two problems that are present now, but not existed in the past. (3)

c) Explain the significance of sustainable development with respect to the above passage (3)

Stories/Cases/Data set - 2

Table 1 Annual average (2015) PM_{10} levels in different cities of India ($\mu g/m^3$)

No	City	State	Annual average
1	Delhi	Delhi	268
2	Faridabad	Haryana	240
3	Kanpur	Uttar Pradesh	201
4	Patna	Bihar	200
5	Agra	Uttar Pradesh	186
6	Mumbai	Maharashtra	107
7	Hyderabad	Telengana	93
8	Chennai	Tamilnadu	81
9	Vishakapatnam	Andhra Pradesh	61
10	Mysore	Karnataka	46

The above table shows the annual average PM_{10} levels in different cities of India for the year 2015. It can be seen that most of the cities are having the pollutant levels higher than the corresponding NAAQS (60 $\mu g/m^3$).

Module II

10 a) Discuss the health effects on human beings due to particulate pollution (4)

b) Give a short note on the air pollution problems faced by any of the above cities (3)

c) Suggest some preventive measures for reducing air pollution (3)

Stories/Cases/Data set - 3

The tardigrade (water bear) undergoes a process called anhydrobiosis: it can remove all water from its body and live in an arrested metabolic state for 150 yrs. Add a drop of water and it completely reanimates. Biomatrica, a San Diego based company, has figured out how to replicate this process and has applied it to DNA and RNA storage. Samples can be stored on shelves at room temperature. This is a significant energy saver when applied to DNA storage systems. This new technology can significantly reduce the energy and maintenance costs. It also decreases the amount of storage space needed to store DNA/RNA samples. Imagine the energy and money savings if all DNA/RNA storage was switched to this process.

Module III

11 a) Briefly describe the technology mentioned in the above passage (4)

b) Give any other (any two) examples of inventions developed based on this technology (3)

c) Discuss the advantages of this technology (3)

Stories/Cases/Data set - 4

The CESE (Centre for Environmental Sciences and Engineering) building at IIT Kanpur has been awarded five star GRIHA rating by TERI. The CESE is a research facility at the IIT (Indian Institute of Technology), Kanpur on a plot area of 175000 square metre (approximately 4.5 acres). The evaluation committee has awarded a final score of 93 out of 100 to the building. The building has incorporated many green features following the GRIHA recommendations. The building is fully compliant with the ECBC. EPI (Energy Performance Index) of the building is predicted to be 45.43 kWh/m^2/annum, which is 41.3% less than the TERI GRIHA benchmark. In comparison to a conventional building, 59% energy savings are predicted in the CESE building. The centre has attempted to conserve and utilize resources efficiently; and recycle, reuse, and recharge the systems at every stage of design and construction.

Module IV

12 a) Suggest few measures that can be adopted for energy efficiency in green buildings. (4)

b) Write a short note on GRIHA rating. (3)

c) Discuss on green material selection with examples. (3)

Stories/Cases/Data set - 5

Country A is a small land locked nation with a predominantly agricultural economy and having a tropical climate (warm dry winters and warm wet summers). At present the nation is self sufficient in food supply and food products are its major export. It has no native fossil fuel resources. It does have a number of rivers which are fast flowing during the wet season but prone to drying up during the dry season. These rivers are vital for irrigation of the agricultural land. Electricity generation presently accounts for 30% of the nation's primary energy consumption, transport accounts for 40% and the remaining 30% for other uses. In order to reduce dependence on fuel imports and to help comply with international treaties limiting carbon emissions, the

government of country A is considering investing heavily in renewable energy.

Module V

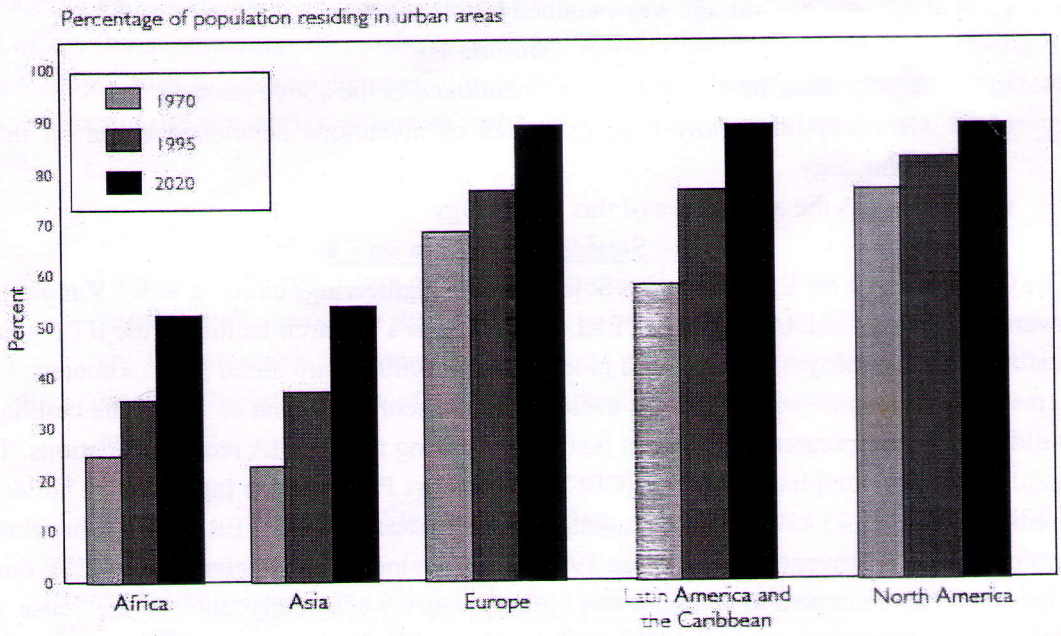
13 a) Which are the different forms of energy through which Carbon emissions can be reduced? (4)

b) Based on the information given above write a short report outlining the relative advantages and disadvantages of two forms of renewable energy for the country. (3)

c) Which form of energy is more appropriate for the country, write your recommendation. (3)

Stories/Cases/Data set - 6

URBANIZATION LEVELS AND URBAN GROWTH RATES BY REGION 1970-2020



Source: WHO (7)

Figure 1

Module VI

14 a) Study the above graph (Figure 1) and write a short note on the increasing intensity of urbanisation with respect to the above data. (4)

b) Explain the concept of sustainable urbanisation. (3)

c) Discuss some of the ill effects due to increasing urbanisation based on the above data. (3)

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