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

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**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
**FIRST SEMESTER B.TECH DEGREE EXAMINATION, JULY 2017**

Course Code: **BE 103**

Course Name: **INTRODUCTION TO SUSTAINABLE ENGINEERING**

Max Marks: 100

Duration: 3 Hours

**PART A**

*Answer all questions; each carries 5 marks*

1. (a) Technology can be treated as a double-sided coin. Comment on this statement with reference to agriculture.

**OR**

(b) Suppose the water in the well near your house tastes bad as well as has a foul odour. You realize that there is a factory nearby and the wastewater percolates through the ground and contaminates the ground water. What would you suggest to do about this problem to your family and the neighbours? To what authority would you complain this? Describe about the authority concerned and the related environmental law/act.

2. (a) (i) What do you mean by Carbon Footprint? (1)

*Read the following passage and answer the question given below it:*

Kerala government has put curbs on traders procuring vegetables from Tamil Nadu after they found that pesticide levels in the vegetables were higher than permissible. Kerala food safety department has written to Tamil Nadu's agriculture and food safety department stating: "pesticides were being used excessively in vegetables produced in Tamil Nadu and sent to Kerala". One reason for such high levels is because harvested vegetables are dipped into pesticide concoctions to ensure they are not eaten away by pests during transport across states, in the report by the food safety department. This defies all guidelines, and shopkeepers complain of dwindling business.

(ii) Mention and explain a single solution to the Carbon Footprint arising as a result of transportation of vegetables as well as the pesticide issue. (4)

**OR**

- (b) (i) Explain 3R concept of waste management. (2)

(ii) What do you mean by E-waste? What are the possible sources of E-waste? How can we dispose E-waste without causing harm to the environment? (3)

3. (a) What do you mean by Bio-mimicking? Explain any two examples for bio mimicking.

OR

(b) The LCA of iPhone 6s is given in Fig.1. Write the Environmental impacts of steps 1 to 5.



Fig. 1

4. (a) List out any five methods for increasing energy efficiency in Buildings.

OR

(b) (i) Green buildings cost more than traditional buildings. Do you agree with this statement or not? Justify your answer? (3)

(ii) Your neighbor plans to construct a new house. Suggest some green materials for the building. (2)

5. (a) Explain a typical wind energy system with block diagram. (5)

OR

(b) (i) What is bio energy? (1)

(ii) Explain briefly any four methods for converting biomass to energy. (4)

6. (a) Iceland is a volcanically active place. Suggest a potential form of non-conventional energy to adopt. Explain in detail.

OR

(b) Neha thinks that India can become a developed country only if it uses more and more energy. George thinks Neha is wrong. Who is right? Why?

7. (a) Suggest some measures to be taken for moving Kerala towards the goal of sustainable poverty reduction.

OR

- (b) (i) Sketch and label the pollution prevention hierarchy triangle (2)  
 (ii) "It is better to prevent waste than to treat the waste or clean up after it is formed." – Comment. (3)

8. (a) Two industries – Industry A and Industry B - emit same amount of CO<sub>2</sub>. Industry A uses a filter to purify the smoke emitting from the chimney. But Industry B plant more trees near the Industry. Which is more sustainable? Why?

OR

(b) Studies show that the total Urban population is expected to rise to 5 billion by the year 2030. What do you think is the reason behind this? How does this affect the sustainability?

## PART B

*(Read the stories/cases/data set as the case may be and answer ALL questions. Each FULL question carries 10 marks)*

## Module 1

KGS Aranmula International Airport was an airport project planned to be built at Aranmula, Kerala in India, at a cost of Rs. 20 billion. The controversial project faces strong protest from environmentalists and local people as well as the opposition parties in Kerala. The project was expected to generate 1,500 direct and 6,000 indirect jobs. Of the 500 acres earmarked for the project, 400 acres were paddy field. The runway for the airport is being constructed over the Kozhithode canal, a tributary of the Pamba. Many hills in the neighbourhood will have to be razed for soil to reclaim the fields, a process that could lead to biodiversity loss and water shortage.

9. (a) What are the three basic pillars of sustainability? Explain. (5)  
 (b) How would have the KGS Aranmula International Airport project affected the three pillars of sustainability if it was implemented? Discuss. (5)

**Module 2**

10. (a) Write a short note on Ozone layer depletion (2)  
(b) Distinguish between greenhouse effect, global warming, and climate change. (3)

A surreal sight greeted residents and commuters at VarthurKodi junction in east Bengaluru on one fine morning – fluffy piles of foam covered the road. From a distance, it looked like the road was covered with snow. But the innocuous-looking foam hid a darker truth – it was toxic foam frothing from an outlet of the nearby Varthur Lake.

Varthur Lake is at the tail end of a network of lakes in the city and sewage that flows into Koramangala or Challaghatta lakes from Puttenahalli in southern Bengaluru and from RT Nagar in north Bengaluru eventually ends up in it. Varthur collects the maximum amount of sewage water, most of it untreated. High levels of Ecoli bacteria found in untreated sewage percolate through the ground to the groundwater table and cause waterborne diseases.

The foam is a result of the water in the lake having high content of ammonia and phosphate and very low dissolved oxygen. Sewage from many parts of the city is released into the lake, leaving it extremely polluted. The foam spilled onto Varthur Main Road, causing a traffic pile up on Tuesday morning. An unbearable stench hung in the air for a 5km stretch around Whitefield.

- (c) From the paragraph above, explain briefly what are the possible reasons for the formation of foams and its encroachment on the road? (2)  
(d) Suggest and explain a possible method of sustainable water treatment method to tackle this situation. (3)

**Module 3**

11. (a) Match Set A with Set B.

*Set A:* ISO 14001, ISO 14040, ISO 14011, ISO 14023

*Set B:* Environmental Labeling, Life cycle Assessment, Environmental Management System, Environment Auditing (2)

- (b) Explain in detail the procedure of EIA in India. (8)

**Module 4**

Development of road infrastructure has not kept pace with the rapid increase in the number of vehicles in Kerala. The number of all class vehicles in the State went up from 1.19 lakhs in 1975 to 36 lakhs in 2006. This was accompanied by increase in road length from 14,870 km to 21,347 km. This shows that like other cities in the country, the cities of Kerala too have responded to

transportation shortfalls by expanding the road network. Although development of road network is important, roads comprise only one component of the entire transport system.

Energy intensity of various transport modes is a key factor in determining transport related environmental impacts. Energy consumption per passenger km by bus is the least and is highest for cars among road based personalised vehicles. On an average, a car consumes six times more energy than a bus, while two-wheelers consume 2.5 times and three-wheelers 4.7 times more energy. In terms of fuel cost per passenger km, a three-wheeler is about six to seven times costlier than a bus and two-wheeler is at least twice costlier than the bus.

Although the traffic density on the roads has increased manifold over the years, the improvements in transportation network have not kept pace with the growth of population and motor vehicles. Transportation problems, experts say need to be tackled in a coordinated, multi-nodal system of road, rail and water transport and also using the latest trends in engineering.

Some initiatives have been taken up by the Government to improve the public transport system and to discourage the entry of private vehicles.

12. (a) Explain the concept of Sustainable Transport System. (3)
- (b) Referring to the above information, list out the impacts of existing transportation system on the three basic pillars of sustainability. (3)
- (c) Infer the paragraphs above and list out the importance and methods for implementing sustainable transportation in Kerala. (4)

#### Module 5

Arya: Aneesh, the article in this magazine says that our coal reservoirs are enough to meet the growing energy demands of present generation. I wonder, then why all are talking too much about alternative energy sources.

Aneesh: Its because it is our responsibility to keep the available resources for our future generations too.

13. (a) Give your comment on this conversation. (2)
- (b) List out the advantages of using renewable energy sources. (3)
- (c) Discuss on the contribution of coal power to Kerala's energy production. (2)
- (d) How can you make use of renewable sources of energy at your home? (3)

Module 6

14. (a) Refer to Fig. 2 given below. What does the figure represent? Explain briefly about the concept. What are its benefits? (4)

(b) What do you mean by Industrial Ecology? Write down the principles and benefits of Industrial Ecology? (6)

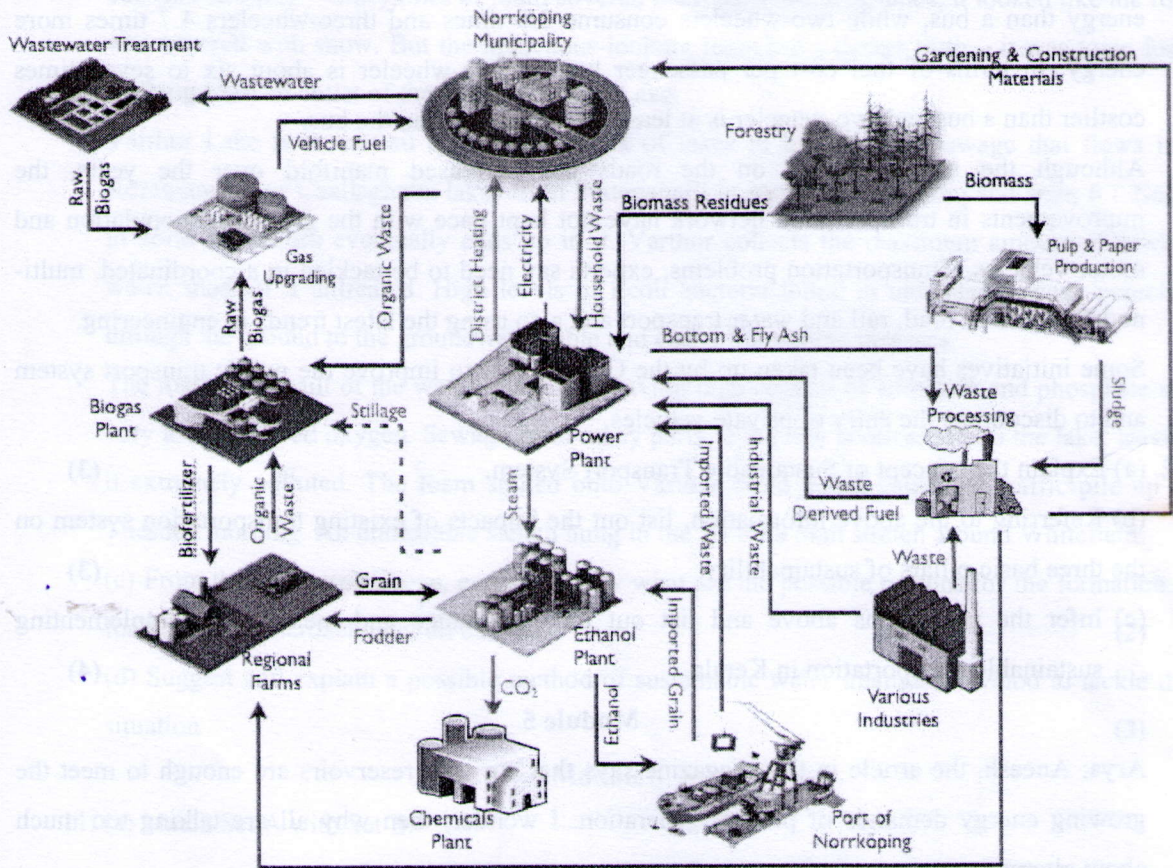


Fig. 2