10303

Reg. No.:_____ Name: _____

FIRST SEMESTER B.TECH DEGREE EXAMINATION, JANUARY 2016

Course Code: BE103

Course Name: INTRODUCTION TO SUSTAINABLE ENGINEERING

Max. Marks: 100 Duration: 3 Hours

Part A

(Answer ALL Questions)

A1. (a). (i). Technology may affect sustainability in positive and negative ways. Give one example each for both cases. (2)

(ii). Comment on the challenges for sustainable development in our country and suggest a way to overcome the same. (3)

OR

A1. (b)(i). Under which act did the Centraland State Pollution Control Boards were established in India? List any three of their primary responsibilities. (3)

(ii). Suggest a project under CDM that could be executed in a village in developing nation (2)

A2. (a)(i). Give any 3 examples of air pollutants and their effect on human health. (3)

(ii). Illustrate a typical sustainable waste water treatment system with block diagram. (2)

OR

A2. (b)(i). What is carbon credit? Explain in not more than five sentences. (2)

(ii). Among the major constituents of municipal solid waste, list any three of the most hazardous waste and highlight their impact on the health/human environment. (3)

A3. (a). Suppose you are required to do the Life Cycle Assessment of an Electric Vehicle. In the utilisation stage, the assessment must be made for the energy used to drive the vehicle. List any three possible impacts of the Electric Vehicle during the usage stage? Suggest a possible way to reduce the impact during utilisation of the vehicle. (3+2=5)

OR

A3. (b). (i). Match the items in the following sets: (2)

Set A: {ISO 14006; ISO 14041; ISO 14048; ISO 14012}

Set B: {LCA Data Documentation Format; Environmental Auditing qualifying criteria; Eco design guidelines; LCA inventory analysis}

(ii). Which steps in Environmental Impact Assessment involve participation from the public? What are the steps involved after the final public consultation? (3)

A4. (a). (i). In order to reduce the energy requirements in Green Buildings, suggest any three design solutions/methods to effect passive cooling during summer months. (3)

(ii). Suggest two water-conserving methods that can be adopted in green buildings (2)

OR

A4. (b). (i).List any three sustainable materials for buildings. (3)

(ii). List any two major characteristics of a sustainable city that address the environmental well-being of the inhabitants. (2)

A5. (a) List five ways in which solar energy could be utilized. (5)

OR

A5 (b). (i).What is biomass energy? How is it extracted? (3)

(ii). Enumerate any two impact of biomass energy on the environment. (2)

A6. (a). Explain a typical wind energy system with a block diagram. (5)

OR

A6. (b). (i).List two methods of extracting energy from the oceans. (2)

(ii). Explain the principle of Geothermal energy generation. (3)

A7. (a).(i). List any three principles of green engineering. (3)

(ii).How can sustainable urbanisation and poverty reduction be related? (2)

OR

A7. (b). What is industrial symbiosis? Give an example. (5)

A8. (a). (i) How does industrial ecology help achieving sustainable development? (3)

(ii). How does material selection influence industrial processes in achieving sustainability? (2)

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

The Nanda Devi Bio sphere Reserve (NDBR) in the western Himalaya has a high level of biological and cultural diversity. The Bhotiya community, whose livelihood is highly dependent on local natural resources, inhabits the buffer zone of NDBR. Bhotiya practice seasonal and altitudinal migration and stay inside the buffer zone of NDBR for only 6 months (May-October). A survey was conducted in 1996 in 5 villages in Pithoragarh District of the buffer zone, where Bhotiya cultivate medicinal plants on their agriculture fields. The aim of the survey was to understand the socioeconomics of medicinal plant cultivation and evaluate the future prospects of this practice in promoting sustainable development among the local community. Of a total of 71 families, 90% cultivated medicinal plants on 78% of the total reported cultivated area (15.29 ha). At the time of the survey, a total of 12 species of medicinal plants were under cultivation, of which 6 were being marketed while the remaining 6 were still under nursery plantation for future propagation. Based on the average productivity, it was estimated that an average family could earn between Rs.4362 and Rs.86, 500 from the sale of medicinal herbs. Encouragement of medicinal plant cultivation at high altitudes in the Himalayas would help to generate better monetary returns as well as conserve these herbs in the wild and preserve traditional ethno medicinal knowledge among local people.

Module 1

QB1.

a) Illustrate how the above story can be related to attaining social, economic and environmental sustainabilities. (1+1+1)
b) Imagine that a campaign on medicinal plant cultivation is to be initiated. Frame a slogan and a key message that need to be addressed. (1+1.5)
c) Enumerate 3 ways to inspire the youth of the Bhotiya community to take up medicinal plant cultivation as their career option. (0.5+0.5+0.5)
d) Identify any two major areas of challenges for the sustainable development in the NDBR. Suggest a way to overcome the same. (2+1)

Sample Case/Data 2

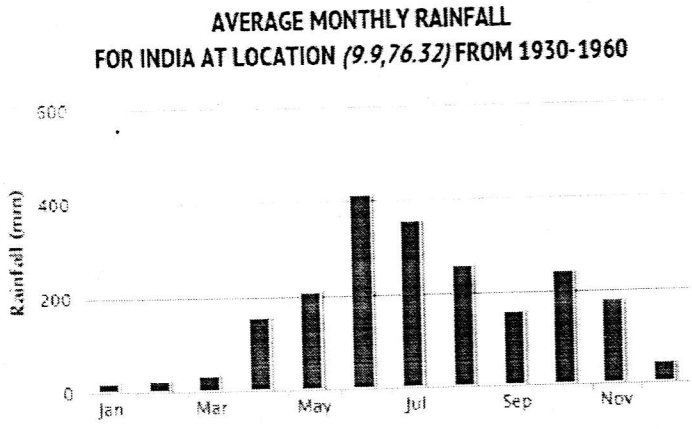


Figure 1: Average monthly rainfall at Kochi for the period 1930-1960

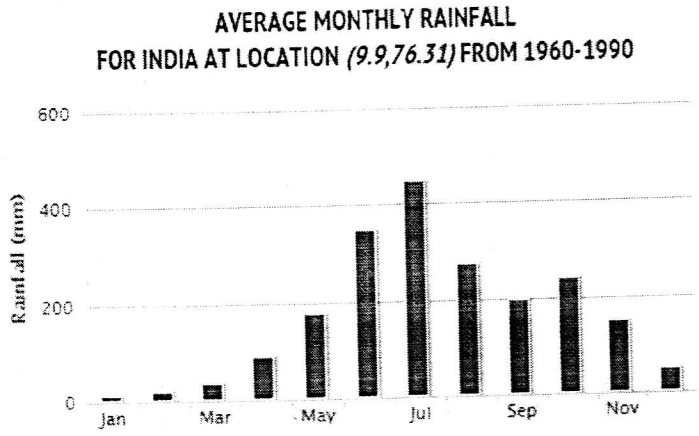


Figure 2: Average monthly rainfall at Kochi for the period 1960-1990

Module 2

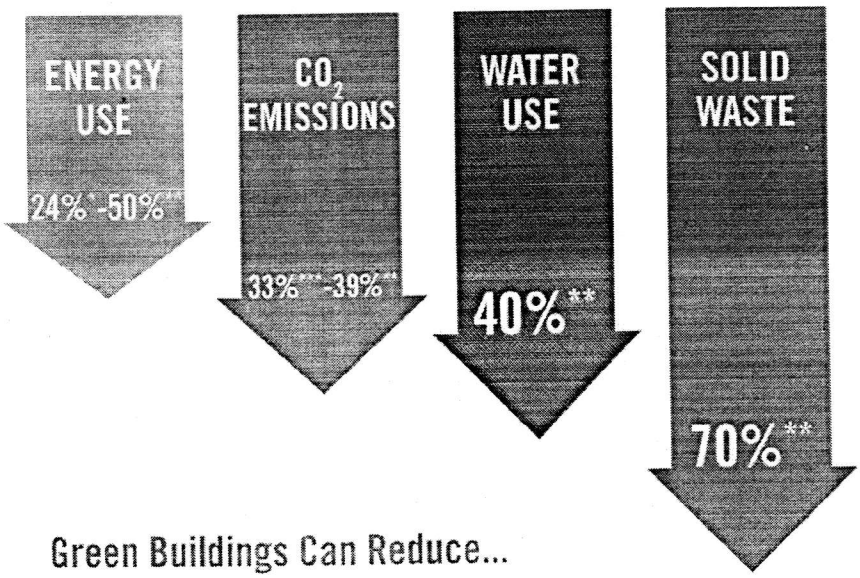
QB2. Referring to Figures 1 and Figure 2, answer the following questions.

a) Compare and contrast the average monthly rainfall at Kochi in the month of July as a pie chart showing as a percentage of total rainfall. (4)
b) Identify the period of North West Monsoon from the figures. (2)
c) Point out any two major reasons for the change of rainfall pattern at Kochi. (2+2=4)

Module 3

QB3. Discuss the LCA analysis of polythene carry bags. (2.5+2.5+2.5+2.5=10)

Sample Case/Data 3



* Turner, C. & Frankel, M. (2008). Energy performance of LEED for New Construction buildings: Final report
** Kats, G. (2003). The Costs and Financial Benefits of Green Buildings: A Report to California's Sustainable Building Task Force
*** GSA Public Buildings Service (2010). Assessing green building performance: A post occupancy evaluation of 12 GSA buildings

Module 4

QB4.

a) Illustrate how green buildings can reduce energy use and solid waste. (3+3=6 marks)
b) How can rain water harvesting be incorporated in the existing design of buildings? How does it lead to the reduction of water use? (2+2 marks).

Sample Case/Data 4

The Gujarat government is all set to develop India's first tidal energy plant. The state government has approved Rs 25 crore for setting up the 50 MW plant at the Gulf of Kutch. It will produce energy from the ocean tides. According to the officials, if this 50 MW plant is successfully commissioned, its capacity will be increased to 200 MW. As per a study conducted by Atlantis Resource Corporation and the state government two years ago, the Gulf of Kutch has a total potential of 300 MW. But despite the huge potential, India has no policy on tidal energy. A clear policy is very important for developers to have clarity on tariff and commercial development of tidal energy in the country. The Gujarat government last year approved a 10 MW tidal energy plant proposed by Urja Global Limited in association with a US-based company Ocean Energy Industries. But no date has been given for starting the project yet.

Module 5

QB5.

a) Suggest two ways to improve the commercial development of tidal energy in India (6)
b) Enumerate two ways to create awareness about Tidal power projects to fishermen. (2)
c) Enumerate a few challenges as to why the proposed Vizhinjam Tidal power project in Trivandrum is not yet implemented. (2)

Sample Case/Data 5

Rapid urbanisation is arguably the most complex and important socio-economic phenomenon of the 20th and 21st centuries. Generally understood as a shift from a predominantly rural to a predominantly urban society, it also represents major and irreversible changes in production and consumption and the way people interact with nature. It is therefore somehow surprising that, within the international debate, it is only recently that cities and the urbanisation process started to be looked at through a 'sustainability' lens.

Module 6

QB6.

a) How can urbanisation and sustainability be combined? Illustrate your answer with two real world examples. (2+3= 5)

b) Relate unsustainable urbanisation to the growing water scarcity in our country and suggest a way to overcome the same. (3+2 = 5)