**BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI**

**Ecology/Ecology and Environmental Sciences (BIO C322/ BIO F 241)**

# Second Semester 2013-14 Comprehensive examination

Date: 11/05/2014 Duration: 90 minMax Marks: 40

***Note 1: Attempt subparts of every question together. Jumbled answers will not be checked.***

***Note 2: No marks would be given for a correct answer with incorrect justification.***

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**PART B OPEN BOOK**

Q1. a) Describe how you could determine the population size of a specific type of plant in a large forest without counting all of the plants. **[1M]**

b) How can biotechnology help in fighting protein -calorie malnutrition prevalent in backward nations? On what factor/s will the success rate depend? Justify with an example. **[2M]**

c) Genetic engineering is a radical new technology which violates fundamental laws of nature. Justify with two examples. **[2M]**

d) Give two examples of organisms that differ greatly in their biotic potential. Justify**. [4M]**

e) What are the advantages to some of the plants of being deciduous in temperate forest? List 4 of such advantages. **[4M]**

Q2. a) *In Hindu mythology, Brahma created a large and monstrous creature that grew so rapidly that it devoured everything in its path!* In reality, predators are much more selective about what they eat. What factors determine what a predator selects to eat among the possible array of potential prey? Discuss briefly. Also mention briefly how predator benefits the prey population and vice versa. **[6M]**

*b) Suppose you choose to become an ecologist after graduation!!* In one of your studies on a pond ecosystem, you find the presence of four species:- species ‘**a**’: 97 members; species ‘**b**’, ‘**c**’ & ‘**d**’: 1 member each. It is evident that species ‘a’ is the dominant one. But in order to publish your data in a research journal, you need to show the result mathematically. How will you do it? Show your calculations clearly. What other alternatives do you have to represent the above results in front of the scientific community? **[6M]**

c) Edgar N. Transeau said in his classic paper, “*The suggestion that our liquid fuels, petroleum and gasoline, may some day be replaced by alcohol made from plants is quite unreasonable*.” What is unreasonable about it and why? As a student of biology in today’s era of genetic engineering, what would you have suggested to him (Give a specific answer)? Also, explain using a flowchart how is alcohol (bioethanol) made from plants. **[6M]**

d) Suppose as a researcher you generate the following data from an experiment. Now, in order to report your results in a research journal, you must interpret the results under the heading ‘Discussion’. Write an appropriate ‘Discussion’ for your research paper in about hundred words. **[6M]**

|  |  |
| --- | --- |
| **Organism** | **PN/A (%)** |
| Bird | 2.5 |
| Reptile | 28 |
| Chimpanzee | 7 |

e) Suppose the defoliation of oak trees by gypsy moth larvae caused the death of extensive forest stands in an ecosystem under study. The recovery of these forest communities after defoliation includes the growth of existing trees and shrubs that escaped defoliation, as well as colonization of the site by tree species outside the community. Is this an example of primary or secondary succession? Why? **[3M]**

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**PART A CLOSED BOOK**

Q1. a) How does an organism benefit from its habitat? **[1M]**

b) Describe how you might use population distribution to find the sources of food or other

resources used by a species. **[2M]**

c) Explain how the carrying capacity for a population can change over time. **[3M]**

d) Give the broad classification of pollutants with examples. Differentiate between bioaccumulation, bioconcentration and biomagnification**. [7M]**

Q2. a) What is palynology? What is the basis for such a branch to exist in ecology? How is it useful to paleoecologists? How has formation of fossils contributed to making earth’s atmosphere favourable for aerobic organisms? Discuss briefly. **[6M]**

b) What are the important factors that determine the dependence of an ecosystem on its input/output environment? Briefly discuss each with the help of an appropriate example. **[6M]**

c) Why is the coral reef ecosystem an example of obligatory mutualism?How does direct competition differ from indirect competition? How does a parasitoid differ from a parasite? Mention the sequence for the above kinds of relationships to develop over time between two interacting species. Discuss briefly in the context of prisoner’s dilemma. **[6M]**

d) What is meant by throughfall?Why does it happen?In what way is the throughfall in a forest beneficial to the native plant community? Calculate retranslocation percentage of phosphorus for neem leaves in a forest given that dry weight percentages of phosphorus are 1.23% in green leaves and 0.36% in senescent leaves respectively. Show your calculations clearly. **[6M]**

e) Where do you professionally imagine yourself five years from now? How could you use the knowledge gained from a study of this course to enrich your immediate office and home environments during that time? Be as specific as you can in your answer. **[3M]**