Anuradha Bhat

Ecology and Conservation (LS3201) Spring 2019 END-SEMESTER EXAM

Name: Roll Number:

TOTAL TIME: 2.5 HRS   **TOTAL MARKS: 50**

INSTRUCTIONS: i) The question paper is divided into 3 sections, each of which must be attempted.

ii) Tick or circle the correct option in Section III and return the entire question paper back along with the answer scripts.

iii) Roll number and name must be written clearly on the top of this sheet (in the space provided).

SECTION I: ANSWER ANY 3 QUESTIONS IN THIS SECTION

1. **Answer the following questions on Conservation and Sustainable development:**
   i. What do you mean by sustainability, in the current global scenario of conservation and development? (1.5)
   ii. How would the use of natural capital determine the level of sustainability that a country can achieve? What, in your opinion, would be a reasonable strategy to achieve sustainability? (2.5)
   iii. What kind of conservation programs are being implemented in India to achieve our current goals of biological conservation along with development? (2)

2. **Answer the following questions on Conservation and Protected Areas:**
   i. What, according to the IUCN, are protected areas? How are they categorized? (1.5)
   ii. Although, we seem to have achieved the global goal of 11% protected areas on earth, why are there still problems for biodiversity on our planet? (2)
   iii. You are part of a team of wildlife managers, policy makers and scientists to chalk out a conservation strategy for your region. What criteria would you adopt to decide the location, size and design of a protected area? (2.5)

3. **Answer the following questions on Marine Biodiversity and Conservation:**
   i. From the fisheries perspective, what does maximum sustainable yield mean? Explain how productivity or harvest is related to harvesting effort. (1.5)
   ii. Economists have proposed models that maximize profits at slightly lower effort than that needed for maximum sustainable yield. Why do fishermen tend to continue fishing beyond the maximum profitable effort? What is bionomic equilibrium? (3)
   iii. List potential remedies that can be employed for management of sustainable fishing practices. (1.5)

4. **Answer the following questions on Ecosystem Stability and Biodiversity:**
   i. Biodiversity is believed to increase ecosystem stability and resilience. Theoretically, in what ways can ecosystem functioning be related to biodiversity? (2)
   ii. Recent experimental studies have attempted to empirically understand the relationship of ecosystem functions with biodiversity. Based on the results of manipulative experiments, in what way does biodiversity affect specific ecosystem functions? Give examples. (2)
   iii. Honey-bee species are currently under extreme threat of extinction. From your understanding of food-webs interactions, ecosystem services, etc. what are the repercussions of their loss, on ecosystems? (2)

SECTION II: ANSWER ANY 3 QUESTIONS LISTED BELOW

5. **An active volcano on a tropical island in the middle of the pacific ocean erupts suddenly resulting in extinction of all forms of life that existed on the island. The nearest mainland is nearly 400 kms away. After several years, life returns on the island and slowly the biodiversity of the island is restored to its earlier glory. Answer the questions below.**
   i. Based on their life history strategies, what kind of species would you expect to first colonize the barren landscape of the island? Discuss with a few examples. (2)
   ii. What would be the basic pattern of ecological succession in the island following the denudation? What would factors would determine eventually, the island's species richness over a period of time? (2)

iii. There were 35 species of birds inhabiting the island before the volcanic eruption. Ecologists visit[ed] island after several decades (following the volcanic eruption) and enumerated the bird diversity once more -they found that the species richness of birds was back to 34 species. Of these, they found that 2(species were the same as those found before the volcano, while 14 species were found to be completely different from the earlier bird fauna. Which aspect of diversity explains this change in faun[a] composition? Provide a simple estimate/index to quantify this change. (2)

6. Answer the questions given below on Diversity and its measurements:
   i. Globally, biodiversity increases from the higher to the lower latitudes. Discuss some of the plausible theories/arguments in favour of this statement. (2)
   ii. The species-area relationship has been used as a useful tool in conservation planning. How can this relationship be applied in conservation? What are the criticisms against relying completely on it?(2)
   iii. Given below are the abundances of bird species in a farmland and a forest area of approx. same size. Which of these habitats has higher bird diversity? Explain why, using a species diversity index. (2)

Species	Farmland	Forested area
Myna	25	8
Sparrow	12	6
Green Bee-eater	6	0
Bulbul	1	7
Crow	3	5
Indian Robin	2	7
Golden Oriole	0	4
Drongo	1	8

7. Answer the following questions on Species extinctions.
   i. What are the main causes for species extinctions in terrestrial ecosystems? Provide examples to support your statements. (2)
   ii. Populations of wild animals can decline due to many human related causes. Why are small populations vulnerable to extinction? (2)
   iii. "We are now in the midst of the sixth mass extinction". Write in support of or against this statement, with suitable examples. (2)

8. Answer ANY THREE of the following questions:
   i. According to Joseph Connell (1978), diversity thrives in habitats subjected to intermediate levels of (disturbance. Why? (2)
   ii. Habitats (such as near lake/river banks; tidal communities etc.) located in the middle of two different kinds of ecosystems are often highly diverse. Explain why. (2)
   iii. In what ways can beta diversity of a region change in response to human impacts like habitat fragmentation and deforestation? (2)
   iv. What makes invasive species "invasive"? Give examples to explain yourself. (2)
   v. Why are big fierce animals rare? Explain in the light of energy flow in ecosystems. (2)

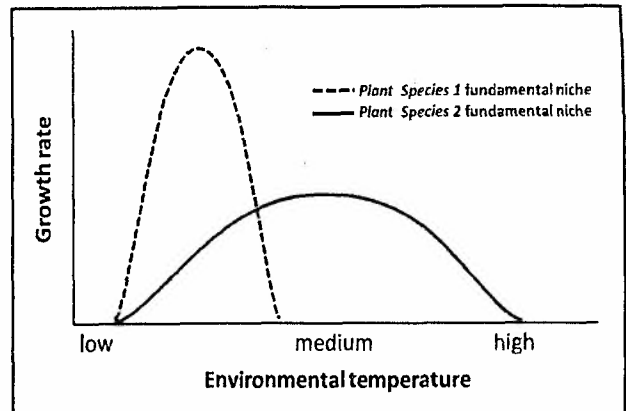## SECTION III: OBJECTIVE TYPE QUESTIONS. TICK OR WRITE THE CORRECT ANSWER. ONE POINT FOR EACH CORRECT ANSWER

1. The Gyps vulture crisis in the early 2000's is thought to have been caused by vultures consuming carcasses of livestock treated with the drug _____.

2. _____ is a tool used in wildlife conservation to identify gaps in conserved and protected areas, and wildlands where significant plant and animal species and their habitat or important ecological features occur.

3. Select the correct order of ecosystems ranked according to increasing *average net productivity per unit area per year(Kcal/m²/yr)*.
    a) Open ocean<Temperate grassland<Savanna< Estuaries
    b) Temperate grassland<Estuaries< Open ocean<Savanna
    c) Estuaries< Temperate grassland< Savanna<Open ocean
    d) Savanna<Temperate grassland<Estuaries<Open ocean

4. The relationship between ecosystem functioning and biodiversity as explained by the redundancy hypothesis assumes that loss of a few species can:
    a) have no relationship to ecosystem functioning
    b) result in reduction of ecosystem functioning
    c) be compensated by similar species performing similar functional role (and therefore maintains the ecosystem resilience)
    d) none of the above

5. The steeper the slope of a rank-abundance diagram if species distributions:
    a) greater is the diversity of the habitat
    b) lower is the evenness of the habitat
    c) greater is the evenness of the habitat
    d) does not explain the evenness of the habitat

6. The fraction of assimilated food energy not used for respiration by consumers and used for their growth & reproduction is called
    a) net secondary production
    b) assimilation of primary production
    c) production efficiency
    d) Gross primary productivity

7. Which of the following criteria should be met for a region to qualify as a biodiversity hotspot
    a) it should have atleast 1,500 vascular plants as endemics, and have only 30% or less of its original natural vegetation remaining (ie. it should be threatened).
    b) it should hold higher number of endangered or critically endangered species than other regions
    c) it should be located in an evergreen rain forest and far away from human habitation
    d) it should be devoid of any invasive species and should have only endemics within the region

8. Nitrogen isotope ratios can be useful to infer
    a) flow of nitrogen from oceans to interiors of forest ecosystems, that can be absorbed by terrestrial organisms
    b) impact of changes in atmospheric chemistry due to climate change
    c) effect of elevated nitrogen levels in cities that can cause global warming
    d) loss of nitrogen absorbing capacity of plants due to reduced soil nutrients

9. The non-seasonal, directional and continuous pattern of colonization and extinction on a site by populations is called:
    a) Migration
    b) Metapopulation dynamics
    c) Succession
    d) Generation

10. The term "Rarefaction" refers to a:
    a) Process by which species become rare
    b) technique to assess species richness from a sample
    c) technique to regenerate species diversity in a region
    d) None of the above

11. The graph below depicts the *fundamental niches* of two plant species (1 & 2). From this figure of fundamental niches you can infer the following:

I. Species 1 is more of a generalist than Species 2
II. Species 2 is more of a generalist than Species 1
III. Species 2 will always outcompete Species 1
IV. Species 2 is more likely to be a successful invasive species than species

    a) Only (I) and (III)
    b) Only (II) and (IV)
    c) Only (I) and (IV)
    d) None of the above

12. Which of the following statements are true with respect to Marine Protected Areas (MPAs):
    i. MPAs can have a great positive impact on marine conservation
    ii. MPAs *always* exclude all human activities (e.g. fishing)
    iii. A large proportion of the world's oceans are occupied by MPAs
    iv. MPAs can have direct economic benefits by increasing fish biomass & total catch
        a) Only (i) and (ii)
        b) Only (i) and (iii)
        c) Only (i) and (iv)
        d) Only (i), (ii) and (iii)

13. Assume a predator searching for food in a multi-prey (with prey species A, and B) habitat. If feeding on prey A is way more profitable than preying on B, the predator will
    a) always prefer A, in any circumstance
    b) switch to the less profitable prey B depending on the abundance of the more profitable prey A
    c) would prey on A or B, depending on which one the predator encounters first
    d) would prey on B if the abundance of B is very high

14. When the population of a species declines, greater frequency of mating with relatives can lead to accumulation of deleterious recessives. This can lead to
    a) population explosion
    b) inbreeding depression
    c) population succession
    d) stochastic variation