

2021
Zoology
Paper ZCT 102
Ecological Theories

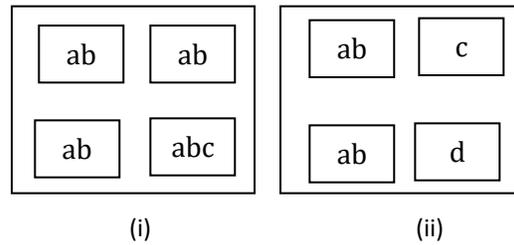
Full marks 50

Time 2 hours

Answer any *Four* Questions

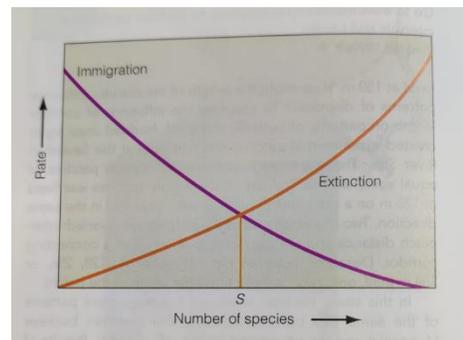
- Q1. (a) Consider a population having K-selected traits with late reproductive maturity and greater competitive ability in crowded conditions. How do you construct a mathematical model that indicates time lags for the above features to explain the population growth rate?
 (b) What are the assumptions perceived while explaining such a model?
 (c) Define Net Reproductive rate and Biotic potential. How can biotic potential be quantified as r_{max} ?
 $5+4\frac{1}{2}+3 = 12\frac{1}{2}$
- Q2. (a) Give reasons behind 'density vagueness' and 'variable carrying capacity' of a population within an environment? How the above-mentioned phenomena lead to a comprehensive understanding of the natural regulation of population number?
 (b) Explain the recruitment function and its implication in constructing the Beverton-Holt model.
 (c) Would you provide reasons for amplitude variations of limit cycles in different populations using family of curves following Ricker's model?
 $(2+4)+3+3\frac{1}{2} = 12\frac{1}{2}$
- Q3. (a) Distinguish between -
 (i) Consumer-imposed equilibrium and resource-imposed equilibrium
 (ii) Resource competition and interference competition
 (b) 'In many instances, the competition between multiple species is avoided through resource partitioning.' Explain resource partitioning in coexisting species with suitable examples.
 (c) With reference to the stability in ecological community, elaborate the equation, $\beta(SC)^{\frac{1}{2}} < 1$, where the symbols have usual meaning.
 (d) Illustrate top-down and bottom-up regulations in ecological community.
 $4+3+3 + 2\frac{1}{2} = 12\frac{1}{2}$
- Q4. (a) Provide an account of the varied types of food web with suitable illustrations. Justify how ecological communities with equal species richness exhibit different food webs.
 (b) How is a bipartite network different from a food web? Explain degree distribution and interaction evenness as metrics of a bipartite network.
 (c) 'Bipartite network is a suitable alternative to frame species conservation through ecosystem based approaches.' - Explain.
 $(3+2) + (2\frac{1}{2}+2) + 3 = 12\frac{1}{2}$
- Q5. (a) What is ecological footprint analysis? How is it different from biocapacity accounting? Mention the assumptions behind ecological footprint analysis.
 (b) Illustrate the concepts of - (i) ecological overshoot, (ii) ecological debt and (iii) ecological deficit. Explain the factors influencing the ecological overshoot.
 (c) State the propositions of 'Deep Ecology worldview'.
 $(2+1+2) + (1+1+1+2\frac{1}{2}) + 2 = 12\frac{1}{2}$
- Q6. (a) What is a Broken Stick Model? Illustrate with a suitable diagram. How is it different from geometric model of species distribution?
 (b) How would you find out if different number of species sampled from two sites are truly different or because of differential sampling effort?

(c) Find out the local and regional diversity of the communities in the two geographical regions in the given illustration:



$$(2+1\frac{1}{2}+2) + 3 + 4 = 12\frac{1}{2}$$

Q7. (a) Explain why the immigration and extinction trajectories are curved and not straight in the diagram below illustrating species colonization. Redraw the diagram for different island sizes and distances from the mainland.



(b) List a few measures by which one can measure ecosystem function. Differentiate between Rivet and Redundancy hypothesis explaining relationship between species diversity and ecosystem function. Does higher species richness contribute to higher resilience capacity? Can you cite any experiment in support of your answer?

$$(2+3\frac{1}{2}) + 3 + 2 + 2$$

Q8. (a) How would you differentiate between an exotic species and an invasive species? What attributes make a species to attain status of an invasive species? Outline 'Increased Competitive Ability Hypothesis' with a suitable example.

(b) What factors made Green Revolution agriculture possible in the country? Outline the basic principles of agroecological framework of agriculture.

$$(2+2+2\frac{1}{2}) + (3+3) = 12\frac{1}{2}$$