

Five Year Integrated M.Sc. Examination, 2019

Semester-VIII

Course: MT-4-8-1

(Mathematical Ecology)

Time: Four Hours

Full Marks: 80

Questions are of value as indicated in the margin.

[All the notations and symbols are used in their usual meaning]

Answer *any four* questions.

1. What is Transmission coefficient? Describe the infection model of pathogen population dynamics and with this model how can you calculate the threshold value? 4+16=20
2. When two populations are in competition, describe different cases of their interactions with a suitable model. 20
3. What is ecological network analysis and how it was developed from the following matrix (constructed by considering the flow from i to $j - f_{ij}$) and the vectors, draw a conceptual model.

0	0	0	0	8881	11184	300	2003
0	0	75	0	1600	0	255	3275
0	0	0	370	200	0	0	1814
0	0	0	0	167	0	0	203
0	5205	2309	0	0	635	860	3109
F					Z	E	R

F = flow matrix; Z (input), E (export) and R (respiration) are vectors. Energy $\text{kcal m}^{-2} \text{day}^{-1}$ are flowing from i (row) to j (column), i_1 = plants, i_2 = bacteria, i_3 = detritivores, i_4 = carnivores, i_5 = detritus. 4+4+12=20

4. Describe ascendancy and development capacity, with the help of ascendancy and development capacity how can the robustness of the ecosystem be measured and what is its significance? 4+4+8+4=20
5. What do you mean by steady state, limit cycle, period doubling and chaos? How does steady state differ from stability? Describe local and global stability? (2+2+2+2)+4+(4+4)=20
6. What do you mean by exergy and how it can be extended to ecological system? 4+16=20