Name : Computational Biology II

Question 1 – *Give a very brief explanation or definition of each of these terms :*

- Epistasis
- Genetic hitchhiking
- Second-order selection

Question 2 – *In an experimental evolution setup such as the LTEE from Lenski and collaborators discussed in class, one observes the fixation of some neutral mutations. What are the possible explanations ?*

Question 3 – *In an experimental evolution setup such as the LTEE, why is parallelism between replicate populations (fixation of the same mutations or of mutations in the same genes) an important question ? Which level of parallelism is observed in the LTEE ?*

Question 4 – *Which environmental conditions favor the selection for cooperative behaviors ? (traits that are costly to the individual expressing them but provide a benefit to the other individuals)*

Question 5 – *Give an example of phenotypic heterogeneity or of a phenotypic switch (where a subpopulation of cells with exactly the same genotype as the others may have a different phenotype)*

Question 6 – *In the article "Memory and modularity in cell-fate decision making" that you have read, the authors claim that "the motile state is memoryless". What does it mean, and which evidence do they give for this claim ?*

Question 7 – *In addition to the motile state, what is the other state in which these cells can grow ?*