**Birla Institute of Technology & Science, Pilani**

**First Semester 2022-2023 Mid semester Examination (Close book);**

**Calculators are allowed;**

**Course Number: BIO F214; Course Title: INTEGRATED BIOLOGY**

**All Questions are Mandatory (Max Marks-60)**

Q1. Sickle-cell anemia is an interesting genetic disease. Normal homozygous individuals (SS) have normal blood cells that are easily infected with the malarial parasite. Thus, many of these individuals become very sick from the parasite and many die. Individuals homozygous for the sickle-cell trait (ss) have red blood cells that readily collapse when deoxygenated. Although malaria cannot grow in these red blood cells, individuals often die because of the genetic defect. However, individuals with the heterozygous condition (Ss) have some defects of red blood cells, but generally not enough to cause mortality. In addition, malaria cannot survive well within these "partially defective" red blood cells. Thus, heterozygotes tend to survive better than either of the homozygous conditions. If 4% of an African population is born with a severe form of sickle-cell anemia (ss), what percentage of the population will be more resistant to malaria because they are heterozygous (Ss) for the sickle-cell gene? (5M)

Q2. Elaborate the following. (25M)

1. Bananas may go extinct. Justify with an example of a historic event. (3+2=5M)
2. Briefly explain various types of polyploidy with examples and their role in evolution. (4+1=5M)
3. Differentiate convergent from divergent evolution with example. (5M)
4. Protists are not monophyletic. (4M)

Q3. Define the following with examples (wherever applicable). (13M)

1. Biological species concept and its drawbacks (5M)
2. Founder’s effect (4M)
3. Homologous structures (4M)

Q4. Draw the schematic of life cycle of malarial parasite (5M)

Q5. Discuss the evidence that supports the theory of endosymbiosis. (5M)

Q6. Enlist the challenges that aquatic plants would have faced while transitioning to land (terrestrial life). (4M)

Q7. Fill in the blanks or state true/false or answer the following..

1. **The oldest known bird fossil is the … ………… (1M)**
2. **Is Extinction happening in current scenario. State True or False (1M)**
3. **Name the protist order which is potentially the common ancestor of all animals. (1M)**