Note: All questions are compulsory. Marks are indicated against each question in square brackets. Calculator is permitted.

Q.1. Explain how nested and overlapping genes are related to each other. Discuss the evolution of these genes with a case study in fruit fly species.   (CO-4) [5]

Q.2. Explain how molecular data changed various evolutionary hypotheses? Discuss the position of human on the mammalian branch with reference to great apes in the light of evolution.

(CO-4) [4]

Q.3. What is genetic code evolution? How the various deviations were observed from the standard genetic code system? Explain with some other genetic code examples in various organisms and organelles.   (CO-3) [4]

Q.4 Discuss the concept of introns evolution through two popular theories. Explain how these theories were estimated through the evolutionary process for the intron's role in regulatory processes?   (CO-2,3) [4]

Q.5. Realize the derivation of non-functionalization time for gene whose fate was decided by its functionality appearance and disappearance during multiple generations.   (CO-4) [5]

Q.6. Explain following while evolution is running in the background: (CO-3-5) [2*4=8]

(i) Nucleotide substitution and replacements   (ii) Genome organization

(iii) Number of amino acid replacements between two proteins (iv) Exon Shuffling

Q.7. Calculate number of rooted and unrooted trees for the given OTUs. Discuss various methods available for reconstructing phylogeny of the organisms. Explain distance-based method for a se of 10 nucleotide sequences belonging to different lineages. Assume required parameters to calculate the evolutionary distance amongst these sequences.   (CO-5) [1+1+3]