10

University of Choice

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY

MAIN CAMPUS

UNIVERSITY EXAMINATIONS

2023/2024 ACADEMIC YEAR

(MAIN EXAMINATION)

FOR THE DEGREE

OF

MASTER OF SCIENCE IN PLANT GENETICS AND BREEDING

COURSE CODE: APB 816

COURSE TITLE: BIOINFORMATICS

DATE: 20.11.2023 **TIME: 8-11AM**

INSTRUCTIONS TO CANDIDATES

Answer **ANY THREE** questions (**20 Marks**)

1. Define the following terms applied in sequence alignment and bioinformatics.

(20 marks)

a) Mismatches.

b) Natural selection.

c) Phenotype.

d) Indel.

e) Homolog.

f) Phylogenetics.

g) E-value.

h) Blastp.

i) Gene mutation.

j) Paralog.

2. a). State two dynamic programming algorithms used for predicting RNA secondary structure and their inventors. (4 marks)

b). Discuss the methods used to construct phylogenetic trees. (10 marks)

c). With the aid of a diagram, illustrate three interactions of RNA structural elements.

(6 marks)

3. Discuss giving examples the application of bioinformatics in molecular genetics in the 21st century. (20 marks)

4. a). Explain three methods that can be used in the prediction of RNA secondary structure. (3 marks)

b.) Define ORF and list three important features in gene prediction/coding sequence.

(6 marks)

c). State at least three motif finding programs. (3 marks)

d). Briefly explain how to identify motifs in a DNA sequence and possible complications involved. (8 marks)

5. a). State the nucleic acid bases that constitute the genetic code of life and pairing patterns. (5 marks)

b). Briefly explain how to identify motifs in a DNA sequence. (5 marks)

c). Define the term microarray. (2 marks)

d). What is the importance of microarray technology? (4 marks)

e). Differentiate the term technical replicates and biological replicates. (4 marks)