M.Sc. 3rd Semester Examination, 2019

ZOOLOGY

PAPER – ZOO-302(Gr. A + B)

Full Marks : 40

Time : 2 hours

Answer **all** questions

The figures in the right-hand margin indicate marks

Candidates are required to give their answers in their own words as far as practicable

Write the answers to Questions of each Groups in separate books

GROUP – A

(*Molecular Evolution*)

[Marks : 20]

1. Answer any *two* questions from the following : 2×2

   (*a*) Why the sequences of human and horse β-globin sequences are much similar ?

(*b*) Define maximum parsimony ?

(*c*) What is the significance of Founder effect ?

(*d*) What are the difference between rooted and unrooted phylogenetic tree ?

2. Answer *two* questions from the following : 4×2

(*a*) Individuals with the genotype bb are 20% less fit than individuals with the genotype BB or Bb. If B mutates to b at a rate of 10^{-6} per generation, what is the expected frequency of b allele when the population reaches mutation selection equilibrium.

(*b*) 10 percent of the males are color-blind in a large population. A group of 1000 from this population migrates to south Pacific Island where there are 1000 inhabitants and 30% of the males are color-blind. Assuming Hardy-Weinberge equilibrium applied what fractions of males are expected to be color-blind in the generation immediately following the arrival of migrants.

(*c*) With regard to genetic drift, are the following statements true or false, if a statement is false explain why.

(*i*) Over the long run genetic drift will lead to allele fixation or loss.

(*ii*) Genetic drift promotes genetic diversity in large population.

(*iii*) Genetic drift is more significant in small population.

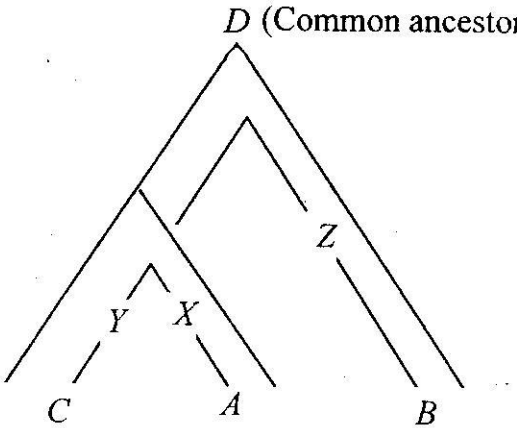
(*iv*) When a new mutation occur within a population genetic drift is more likely to cause the loss of new allele rather than the fixation of the new allele.

(*d*) In the distance matrix shown here, which pair of taxa should be joined first and what is the resulting UPGMA distance matrix.

	B	*C*	*D*	*E*
A	8	15	19	24
B		20	18	16
C			5	4
D				2

3. Answer any *one* questions of the following : 8×1

(*a*) The parsimonial mutational distance for a particular protein comparison between species *A* and *B* is 25 between *A* and *C* is 20 and *B* and *C* is 30



Find out the value of *X*, *Y* and *Z*.

(*b*) In a homologous region containing 10000 bp the following number of sequence differences are found

	Human	Chimpanzee	Gorilla	Orangutan	Rhesus Monkey
Human	0	145	151	398	851
Chimpanzee	145	0	197	294	855
Gorilla	151	197	0	304	840
Orangutan	398	294	304	0	810
Rhesus Monkey	851	855	840	810	0

Construct a gene tree using UPGMA method.

GROUP – B

(*Microbiology*)

[Marks : 20]

4. Answer any *two* questions from the following : 2×2

(*a*) State the uniqueness and divisions of Bergey's manual. 2

(*b*) Define virus. Where can we see alternation of generation ? 1 + 1

(*c*) Why are spores so resistant ? Cite the stages of sporulation. 1 + 1

(*d*) What is the purpose of Benchtop tests ? 2

5. Answer any *two* questions from the following : 4×2

(*a*) Define CFU ? What is the relationship between growth rate and generation time ? $1 + 3$

(*b*) Chalk cut the major differences between a light microscope and a SEM. 4

(*c*) How heterotrophic bacteria are different from autotrophic ones ? Write a short note on bacterial fermentation. $2 + 2$

(*d*) Describe the mode of communication among bacteria. Relate flagellar arrangement with bacterial movement. $2 + 2$

6. Answer any *one* question from the following : 8×1

(*a*) (*i*) Draw and describe the role of various microorganisms in soil environment.

(*ii*) How can you identify responses to oxygen by observing patterns of bacterial colonies grown in a test tube medium ? $4 + 4$

(*b*) (*i*) Illustrate the networking structure of peptidoglycan in a bacterial cell wall.

(*ii*) Classify culture media broadly with their purposes. 4 + 4
