THE OPEN UNIVERSITY OF SRI LANKA

B.Sc. DEGREE PROGRAMME – LEVEL 04

FINAL EXAMINATION – 2014/2015

BOTANY

BOU2101/BOE4101 – GENETICS and EVOLUTION

DURATION : TWO (02) HOURS

DATE :8th May 2015 TIME : 9.30 – 11.30 a.m.

ANSWER **FOUR (04)** QUESTIONS SELECTING AT LEAST **ONE (01)** FROM EACH PART.

Answers to the questions in Part A and Part B should be written in separate answer books.

PART A

1.

A). Explain briefly why three-point crosses are useful in learning about the nature of gene linkage.

B). *Zea mays* plants homozygous for the recessive gene "variable sterile" (*va*) exhibit irregular distribution of chromosomes during meiosis. Yellowish-green seedlings are the result of another recessive gene called "virescent" (*v*). A third recessive gene called "glossy" (*gl*) produces shiny leaves. All three of these genes are linked. Two homozygous plants were crossed and produced an all normal F_1. When the F_1 was test-crossed, progeny phenotypes appeared as follows :

60	virescent
7	glossy
4	variable sterile, virescent
48	virescent, glossy
40	variable sterile
62	variable sterile, glossy
270	variable sterile, virescent, glossy
235	wild type

i). What are the genotypes and phenotypes of the original parents?

ii). Diagram the linkage relationship in the F_1

iii). Determine the gene order.

iv). Calculate the amount of recombination Observed.

2.

A). i). What is Co-dominance? Briefly explain.

ii). A pair of co-dominant alleles governs cotyledon colour in long beans. The homozygous genotype *GG* produces dark green cotyledons, the heterozygous genotype *GY* produces light green cotyledons, and the other homozygous genotype, *YY* produces yellow cotyledons, deficient in chloroplasts and the seedlings do not grow to maturity.

a) If dark green plants are cross-pollinated with light green plants, what genotypic and phenotypic ratios would be expected in the mature progeny plants?

b) If light green plants are self-pollinated, determine the phenotypic and genotypic ratios in the seedling progenies.

B). i). What is epistasis? Briefly explain.

ii). Brown colour in corn kernels is produced by the genotype *B-C-* , White colour is produced by the double recessive genotype (*bbcc*). The genotypes *B-cc* and *bbC-* produce Yellow kernels. A homozygous Brown variety is crossed to a White variety.

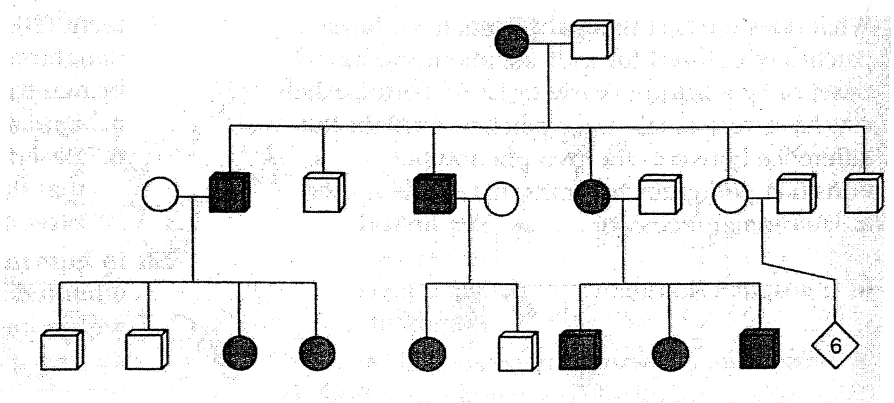
a) What phenotypic results are expected in the F_1 and F_2?

b) If a homozygous Yellow F_2 is artificially crossed at random, what phenotypic and genotypic proportions are expected in the offspring?

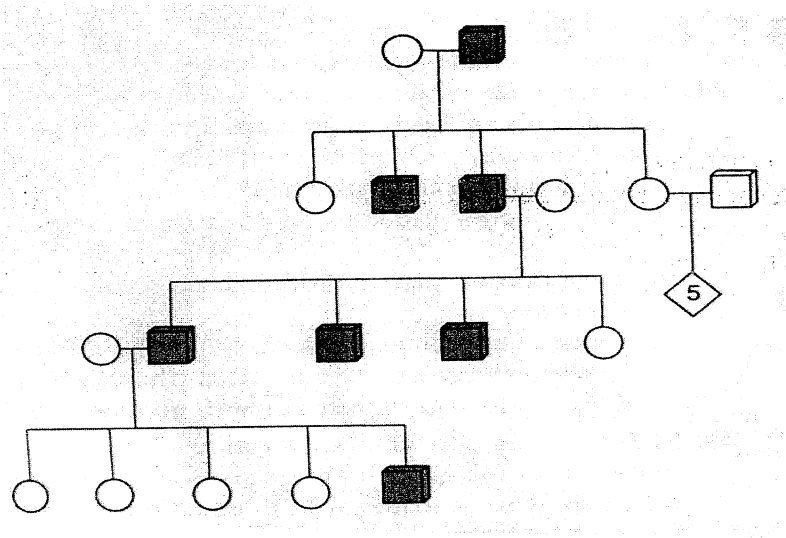
3.

A) Give a brief account of the importance of pedigree analysis in humans.

B) Determine the possible modes of inheritance for each trait in the two pedigrees (X and Y) given below. Briefly explain your answer.



X



Y

PART B

4. Describe how variations occur among the individuals in a natural population?

5. Describe the evidences for evolution upon which Darwin based his ideas on common descent.

6. Write short notes on <u>any three</u> of the followings:
   a. Evolutionary links
   b. Post zygotic isolating mechanisms
   c. Prosimians
   d. Origin of early earth
   e. Industrial melanism