THE OPEN UNIVERSITY OF SRI LANKA
B.Sc. DEGREE PROGRAMME – LEVEL 05
FINAL EXAMINATION – 2006/2007
BOTANY
BTU 3111/BTE 5111 – PLANT BREEDING

DURATION : TWO and HALF (21/2) HOURS

DATE : 21. 04. 07 TIME : 10.00 a.m. to 12.30 p.m.

ANSWER ANY FOUR 04) Questions

1.

a) What is heritability ?

b) What is the difference between broad-sense heritability and narrow-sense heritability ?

c) Two homozygous varieties of wheat were crossed to produce F_1 hybrids. The average phenotypic variance in yield of the three populations P_1, P_2 and F_1, was 10.60. The variance of F_2 was 20.60.

i) Calculate the heritability of yield in the F_2 population.

ii) Do you think that subsequent selection in future generations would be successful in further changing the yield in wheat ?

d) In rice, the inbred lines, A, B, C, D and E were crossed in all possible combinations in a diallel cross. The progeny produced the following data for the yield.

	A	B	C	D	E
A	30	32	41	31	30
B	40	39	41	34	32
C	41	38	41	35	35
D	31	40	38	34	29
E	31	33	30	26	19

i) Calculate the General Combining Ability (GCA) of each line.

ii) Select the best line for GCA.

2.

a) What are Plant Genetic Resources ?

b) Describe in brief the causes of genetic erosion.

c) Explain how the exploration and collection of Plant Genetic Resources are done at the Plant Genetic Resource Centre (PGRC).

d) Give a brief description of how Characterization and Evaluation of crop germplasm is done at PGRC.

3.

a) What is a mutation ?

b) Write a brief account of the types of mutations observed in plants.

c) Describe the procedures used for mutation breeding in self-pollinated and cross-pollinated plants.

d) What are the uses of mutation breeding in plants ?

e) What are the limitations of mutation breeding in plants ?

4.

a) Explain the following;
Average effect (α), Breeding value (A) and Dominance deviation (D)

b) The wing length (*l*) in *Drosophila* is a recessive trait. The wing length of three genotypes in *Drosophila* at 3 weeks of age are approximately as follows;

	Genotypes		
	++	+*l*	*ll*
Wing length in mm	12	10	7

Find out the average effects of the genes. (Assume $q = 0.4$)

c) Name the four (04) main factors which contribute to the change in gene frequency of a population. Explain briefly how each factor causes change in gene frequency.

d) At a particular locus which controls the flower colour, there are two alleles, *C* and *c*. The mutation rate of *C* to *c* is 3.0×10^{-5}, whereas the mutation rate of *c* to *C* is 6.0×10^{-7}. Allele frequency (*p*) of *C* is 0.6.

Assumption : No other factor is operating in the population to disturb the equilibrium.

What is the equilibrium frequency of *c* allele ?

5.

a) What is intended by Genetic Engineering of plants ?

b) Explain how herbicide resistant plants were developed using biotechnology.

c) Give an account of how male sterility has been developed in crop plants with the aid of biotechnology.

d) Indicate the advantages and disadvantages of genetically modified plants.

6.

a) What are hybrid varieties ?

b) What is Hybrid Vigour ?

c) Explain briefly how hybrid vigour is utilized in a breeding programme.

d)

i) Use a flow chart to explain the **Back cross** method of breeding.

ii) Describe the procedure/s you would follow to transfer
(a) a dominant gene and
(b) a recessive gene
to the recurrent parent using back cross method.