INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
DEPARTMENT OF BIOSCIENCES AND BIOENGINEERING
Genetics (BT 204)
End-Semester Examination

Date: November 28, 2022 **Total Marks: 50**

NOTE:

- ***Read the questions carefully. All questions are compulsory.***
- **Explain through the crosses, wherever required.**
- **For numerical questions, all steps are to be mentioned resulting into the final answers.**

Q 1. If a cross produces an F_1 progeny in the ratio of 3 hen-feathering : 1 cock-feathering and 1/3 of the hen-feathering progeny is males, give the genotypes of the parents. Use the symbols **H** and **h** for feathering type and **Z** and **W** for sex type. **[Marks 4]**

Q 2. A geneticist has estimated the number of exchanges that occurred during meiosis on each of 100 chromatids that were recovered in gametes. The data is as follows: **[Marks 4]**

No. of exchanges	Frequency
0	15
1	40
2	23
3	16
4	6

What is the genetic length in centiMorgans of the chromosome analyzed in this study?

Q 3. Red-green color blindness is a human X-linked recessive disorder. Jill has normal color vision, but her father is color blind. Jill marries Tom, who also has normal color vision. Jill and Tom have a daughter who has Turner syndrome and is color blind: **[Marks 4]**

(a) How did the daughter inherit color blindness?

(b) Did the daughter inherit her X chromosome from mother Jill or from father Tom?

Q 4. Considering baldness and short index finger to follow the sex influenced mode of inheritance, i.e. dominant in men and recessive in women, using the allelic symbols B^1 and B^2 for balding gene pair and F^1 and F^2 for index finger size (long or short) gene pair, indicate the possible genotypes and the phenotypes thereby produced in men and women. **[Marks 4]**

Q 5. Assume that plant weight is determined by a pair of alleles at each of the two independently assorting loci (***A*** and ***a***, ***B*** and ***b***) that are additive in their effects. Further assume that each allele represented by an uppercase letter contributes 4 g to weight and that each allele represented by a lowercase letter contributes 1 g to weight: **[Marks 5]**

(a) If a plant with genotype ***AA BB*** is crossed with a plant with genotype ***aa bb*** , what weights are expected in F_1 progeny of this cross?

(b) If the F1 plants are intercrossed, what are the distribution of expected weights and proportions of the F_2 Plants?

Q 6. Chickens, like all birds, have ZZ-ZW sex determination. The bar-feathered phenotype in chickens results from a Z-linked allele that is dominant over the allele for nonbar feathers. A barred female is crossed with a nonbarred male. The F_1 from this cross are intercrossed to produce the F_2 progeny. What will be the phenotypes and their proportions be in the F_1 and F_2 progeny? **[Marks 5]**