This question paper contains **4+1** printed pages]

Roll No. | | | | | | | | | | | |

S. No. of Question Paper : **5624**

Unique Paper Code : **216/223/589** **F**

Name of the Paper : **Genetics and Genomics—I (GGHT-501)**

Name of the Course : **B.Sc. (Hons.) Anth./Bot./Biochem./Bio-Med./Microbiology/Zoology**

Semester : **V**

Duration : **3 Hours** Maximum Marks : **75**

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt *five* questions in all,

including Question No. **1** which is compulsory.

1. (*a*) Define any *five* : 5×1=5

(*i*) Robertsonian translocation

(*ii*) Test cross

(*iii*) Transgressive variation

(*iv*) Synteny

(*v*) Allopolyploid

(*vi*) Missense mutation

(*vii*) Karyotype.

P.T.O.

(*b*) Expand the following : 1×3=3

(*i*) PAR

(*ii*) cM

(*iii*) mt DNA.

(*c*) Give important contributions of the following scientists in the field of genetics : 1×4=4

(*i*) C.B. Bridges

(*ii*) H. Nilsson-Ehle

(*iii*) J.H. Tijo and A.Levan

(*iv*) H.J. Muller.

(*d*) Answer the following :

(*i*) Tortoise shell cats are always females. Explain. 2

(*ii*) Write the number and types of gametes that will be formed in an individual with the genotype AABbccDdEe. 2

(*iii*) Determine the phenotypes (shell coiling pattern) of the parents and the genotypes and phenotypes of the F_1 in the following crosses in *Limnaea peregra* : 2

(1) Dd (female) × dd (male)

(2) Dd (male) × dd (female).

(*iv*) A mother has blood group A and father has blood group O. What can be the possible blood group of their children ? 1

2. (*a*) Differentiate between the following terms : 2×5=10

(*i*) Co-dominance and Incomplete dominance

(*ii*) Maternal influence and Maternal inheritance

(*iii*) Multiple alleles and Polygenes

(*iv*) Transition and transversion

(*v*) Homogametic and heterogametic sex.

(*b*) Explain the attached X method for detection of X linked recessive lethal mutation in *Drosophila*. 4

3. (*a*) Describe the sex determination mechanism in humans and explain the role of the Y chromosome. 7

(*b*) Describe the experimental evidence for cytological basis of crossing over. 7

4. (*a*) What are chemical mutagens ? Give *one* example of each category. Explain the molecular basis of mutation caused by any *one* of them. 8

(*b*) How is organelle heredity different from nuclear inheritance ? Explain the inheritance of leaf variegation in *Mirabilis jalapa*. 6

5. In *Drosophila,* a cross was made between a female expressing the three X-linked recessive traits, scute (*sc*) bristles, sable body (*s*) and vermillion eyes (*v*), and a wild type male. In the F_1, all females were wild type, while all males expressed all three mutant traits. The cross was carried out to the F_2 generation, with the results shown here.

Phenotype			Offspring
sc	*s*	*v*	314
+	+	+	280
+	*s*	*v*	150
sc	+	+	156
sc	+	*v*	46
+	*s*	+	30
sc	*s*	+	10
+	+	*v*	14

(*a*) Are the above genes linked ? Give reasons for your answers. 2

(*b*) Diagram the crosses giving the genotypes of parents and F_1. 3

(*c*) What is the order of the genes ? 2

(*d*) Calculate the map distance between the genes and construct the linkage map. 3

(*e*) Calculate the coefficient of coincidence. 2

(*f*) Calculate the interference and comment on its significance. 2

6. (*a*) Describe the different chromosomal aberrations involving change in chromosome numbers. 7

(*b*) In a dihybrid cross, two corn plants with green seedlings were crossed and the following progeny were obtained :

181 green seedlings, 45 virescent-white seedlings, and 14 yellow seedlings.

Find out the probable segregation ratio. Write the genotypes of parents, F_1 and genotypes and phenotypes of F_2 plants. Explain the genetic basis of inheritance. 7

7. Write short notes on any *four* of the following : 3½×4=14

(*i*) Quantitative traits

(*ii*) Position effect

(*iii*) Environmental factors in sex determination

(*iv*) Somatic cell hybridization

(*v*) Pleiotropy.