BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI
FIRST SEMESTER 2023-24
BIO G512 (Molecular Mechanism of Gene Expression)
Mid-Semester Examination (OPEN BOOK)
Duration: 1.30 Hrs **12.10.2023** **Maximum Marks: 30**

Q-1 A mouse heterozygous for Black body colour, long tail and large body was test crossed with mouse having yellow body colour, short tail and small body. It was found that the heterozygous parent has trans condition for tail gene. Following is the result for test cross-

Black, short, Large	Black, Long, small	Black, short , small	Yellow, long, small	Black, long, Large	Yellow, short, large	Yellow, Long, large	Yellow, short, small
225	46	25	230	152	49	30	143

(I) Prepare the linkage map

(II) Calculate the interference **[5.0 +5.0 Marks]**

Q-2 (a) Eight independently isolated mutants of *E.coli*, all of which are unable to grow in the absence of histidine (his-), were examined in all possible *cis*- and *trans*- heterozygotes. All the *cis*-heterozygotes were able to grow in the absence of histidine. The *trans*-heterozygotes yielded two different responses: some of them grew in the absence of histidine and some did not. The experimental results, using (+) to indicate growth and (0) to indicate no growth are given in the following table.

Mutants;	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
8	0	0	0	0	0	0	+	0
7	+	+	+	+	+	+	0	
6	0	0	0	0	0	0		
5	0	0	0	0	0			
4	0	0	0	0				
3	0	0	0					
2	0	0						
1	0							

How many genes are defined by these eight mutations? Which mutant strains carry mutations in the same gene(s)? **[5.0 Marks]**

(b) What key strategy did Seymour Benzer adopted to reduce the number of required crosses from more than half a million to several thousand? **[5.0 Marks]**

Q-3 Answer briefly-

(a) Genes can be isolated on the basis of conservation of exons". Justify this statement with a suitable example.

(b) Assume that prokaryotic RNA Pol does not proofread. Do you expect high or low level of errors in transcription as compared with DNA replication? Why it is more important for DNA Polymerase than RNA polymerase?

(c) What product would DNA-RNA hybridization produce in a gene with five introns? No introns? Draw these hybrid molecules. **[4.0 +3.0+3.0 Marks]**