JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- 2025

M.Sc. Ist semester (BT)

COURSE CODE (CREDITS): 20 MS1BT115 (02)　　　　MAX. MARKS: 35

COURSE NAME: Genetics

COURSE INSTRUCTOR: Prof. Sudhir Kumar　　　　MAX. TIME: 2 Hours

Note: *(a) All questions are compulsory.*

(b) The candidate is allowed to make suitable numeric assumptions wherever required

for solving problems. Calculator is allowed.

Q.No.	Questions	CO	Marks
1	An autosomal recessive disorder appears in a pedigree where two unaffected parents have an affected child, and an unaffected daughter later has an affected child with a normal spouse. In the same population, the disorder occurs in 1 in 2,500 individuals; affected individuals have 20% lower fitness, but heterozygous carriers have no reduction in fitness. Using this information, (i) deduce likely genotypes of pedigree members, (ii) calculate q and carrier frequency under Hardy–Weinberg equilibrium, and (iii) apply Fisher's Fundamental Theorem to estimate the increase in mean fitness per generation due to selection at this locus.	I	08
2	a) A man is suffering from Y-linked disorder marris to a normal woman. Determine the probability that 02 out of 04 children will inherit this disorder. State clearly any assumptions used. b) Construct a four-generation pedigree for an X-linked dominant disorder using suitable assumptions.	II	3+3
3	The appearance of plaques of varying morphology on a bacterial lawn indicates the presence of mutant bacteriophages. Design an experiment to detect phage mutants and *illustrate* it with an example.	III	5
4	Explain the principle of complementation analysis in Drosophila and evaluate its significance in identifying functional gene units.	III	5
5	a) Many complex traits are useful in animal husbandry. Provide an example and justify its relevance. b) Differentiate between phenotypic markers and genetic markers, and discuss their applications.	II	3+2
6	a) Explain gene pyramiding and its major applications. b) Mention the application of synthetic lethality in curing human diseases.	IV	3+3