

(2 Hours)

Marks : 40

NB : (1) All questions are Compulsory.

(2) Draw neat labelled diagrams wherever necessary

- Q.1 a How transposition can cause mutations in cells? 2
 b Explain the two types of mobile genetic elements present in bacteria. 2
 c What is the importance of horizontal transfer of genetic material in bacteria? 2
 d What is specialized transduction? 2
 e Outline the steps for natural transformation in *Bacillus subtilis*. 2
- Q.2 a Distinguish between Prototrophs and auxotrophs. 2
 b How are F' factors generated? 2
 c How does a geneticist doing interrupted mating experiments know that the locus for the drug sensitive allele, used to eliminate the Hfr bacteria after conjugation, has crossed into the F- strain? 2
- Q.3 a In a transduction experiment, the donor was $g^+ e^+ f^+$ and the recipient $g^- e^- f^-$. selection was for g^+ . The four classes of transductants from this experiment are given below: 3

Class	Genetic composition	Number of individuals
1	$g^+ e^+ f^+$	57
2	$g^+ e^+ f^-$	76
3	$g^+ e^- f^-$	365
4	$g^+ e^- f^+$	2
Total		500

- a) Determine the cotransduction frequency for g^+ and e^+ .
 b) Determine the cotransduction frequency for g^+ and f^+ .
 c) Which of the cotransduction frequencies calculated in (a) and (b) represents the greater actual distance between the genes? Why?
- b Explain the role of RuvABC complex in resolution of Holliday junction. 3
Or
 Explain the Holliday model for homologous recombination
- Q.4 a What are plasmids? Explain briefly any 2 types 3
 b Write a short note on plasmid incompatibility. 3
Or

Write the principle and method of isolation of plasmids.

Q.5 a What is artificial transformation in bacteria. Explain two methods for the same. 3

b Write a short note on composite transposons. 3

Or

Integrations are major mechanism for spread of multidrug resistance. Explain why?

Q.6 a What is catabolite repression? 3

b Explain the regulation of tryptophan operon by attenuation 3

Or

i. Indicate whether for the following genotype, β -galactosidase and permease will be produced or not in the absence and presence of inducer:

Inducer absent	Inducer present
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β -galactosidase	permease
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a) $I^+ P^+ O^c Z^+ Y^-$

b) $I^- P^+ O^+ Z^+ Y^-$

ii) What is the difference between constitutive gene expression and regulated gene expression?