**3 Hours**

**Total Marks: 100**

1. Attempt **all** questions.
2. **All questions** carry **equal** marks.
3. Draw **neat labeled diagrams** wherever necessary.
4. Use of **log tables** and **non-programmable calculator** is **allowed**.

**Q.1 a. Explain the terms: (Any six)** **06**

1. Transgenic plants.
2. Microprojectile.
3. Protoplast.
4. Electroporation.
5. Polylinker site.
6. Co-cultivation.
7. Disarming.
8. Wound response.
9. Selectable marker.

**Q.1 b. Answer the following questions: (Any two)** **14**

1. Describe liposome mediated gene transfer.
2. Add a note on any one pTi derived vector system.
3. Explain the role of viruses in plant transgenesis.

**Q.2 a. Explain the following : (Any six)** **06**

1. Embryonic stem cells.
2. Transgenic founder.
3. Karyogamy.
4. Knock out mouse.
5. Biosensor.
6. Quiescent state.
7. cre gene.
8. Senile plaques.
9. XenoMouse.

**Q.2 b. Give an account of the following questions: (Any two) 14**

1. Establishment of transgenic mouse by DNA microinjection.
2. Positive-negative selection system for transgenic mice.
3. Applications of transgenic fish.

**Q.3 a. Do as directed: (Any six) 06**

1. Give significance of cosmid vectors.
2. State the significance of 'multiple cloning site' in modern vectors.
3. Give significance of 'shuttle vectors'.
4. Name a sticky end forming restriction enzyme.
5. Define: chromosomal library.
6. State the significance of 'Southern blotting'.
7. Name the membrane used for transfer of DNA from gel during hybridization studies.
8. What is 'YAC vector'?
9. Name a vector that employs 'blue white selection strategy'.

**Q.3 b. Answer the following questions: (Any two) 14**

1. Explain different techniques used for screening of genomic library.
2. Elaborate on construction of cDNA library.
3. How can one achieve maximum expression of cloned gene? Elaborate on different strategies that can be applied to achieve the same.

**Q.4 a. Do as instructed: (Any six) 06**

1. Define `RNA interference'.
2. Fill in the blank: TALENs contain DNA cleavage domain named as _____.
3. What is the natural function of CRISPR?
4. State the role of flurochrome in automated sequencing.
5. Give significance of Piperidine.
6. Define `Shotgun sequencing'.
7. Fill in the blank: Si RNA is _____. (Single stranded/double stranded)

8. State true or false: Fok 1 is a part of RNAi.
9. State true or false: Maxam Gilbert method is based on enzymatic degradation by ddNTP.

**Q.4 b. Answer the following questions: (Any Two)** **14**

1. Describe the components and activity of CRISPR/Cas system.
2. Explain the principle and method of Sanger's sequencing.
3. Compare and contrast between ZFN and TALENs.

**Q.5 Write short notes on the following: (Any four)** **20**

**a.** DNA markers used for mapping human genetic variability.
**b.** Pyrosequencing method.
**c.** Cre-*loxP* recombination system for activating a gene
**d.** Particle gun method
**e.** Improvement of seed quality protein
**f.** Chromosome walking