AGRICULTURAL BIOTECHNOLOGY
(BIOT 5141)

Time Allotted : 3 hrs **Full Marks : 70**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**

(i) Symbiotic relationship between fungi and roots of higher plant is called
(a) Lichen (b) Mycorrhiza (c) Mutualism (d) Helotism.

(ii) Formation of new genes takes place due to
(a) inversion (b) transduction (c) transversion (d) mutation.

(iii) The major advantage of a plant with VAM is
(a) Increased N_2 absorption (b) Increased P absorption
(c) Increased K absorption (d) Increased Mn absorption.

(iv) Dwarf is an important character in hybrid technology because
(a) Efficient dry matter partitioning (b) Improved light reaction
(c) Improved dark reaction (d) All of the above.

(v) Molecular markers are used to construct
(a) chromosome maps (b) cytogenic maps
(c) physical maps (d) all of those.

(vi) C4 plants have an advantage over C3 plants because
(a) Rubisco first binds CO_2 (b) PEPC first bind CO_2
(c) Either of the two bind CO_2 (d) none.

(vii) The technology used to develop transgenic tomato is
(a) Antisense RNA (b) RNAi
(c) Sense RNA (d) none of these.

(viii) Which aquatic fern is used to increase the yield paddy in the field
(a) Marsilea (b) Azolla
(c) Salvinia (d) all the above.

(ix) HMG CoA reductase is required for the synthesis of
(a) IPP (b) flavonoid
(c) gibberellin (d) none of these.

(x) Locations of quantitative genes on chromosomes are called
(a) Qualitative trait loci (b) quantitative trait loci
(c) both of (a) and (b) (d) none of these.

Group- B

2. (a) Mention the utilty of marker in the improvement of plant science. [(CO4)(Discuss/LOCQ)]
(b) Describe briefly the types of marker in this aspect. [(CO4)(Describe/LOCQ)]
(c) Mention briefly the different approaches followed for the development of functional marker. [(CO4)(Discuss/IOCQ)]
3 + 4 + 5 = 12

3. (a) Define QTL. [(CO4)(State/LOCQ)]
(b) Mention the situation where Advanced backcross AB-QTL analysis is used citing the crop names. [(CO4)(Apply/IOCQ)]
(c) Evaluate the process of EcoTILLING method in various agricultural applications. (CO4)(Evaluation/HOCQ)]
2 + (3 + 2) + 5 = 12

Group - C

4. (a) What is the importance of following terms with respect to grain yield:
(i) Photosynthetic efficiency
(ii) Dry matter partitioning. [(CO2) (Understand/IOCQ)]
(b) How photosynthetic efficiency can be improved by engineering light reaction? [(CO2) (Analyse/HOCQ)]
(3 + 3) + 6 = 12

5. (a) Describe the methodology of developing the construct that was used to develop Golden Rice. [(CO4) (Describe/IOCQ)]
(b) Schematically show the biochemical pathway that has been engineered starting from GGPP. [(CO4) (Remember/LOCQ)]
6 + 6 = 12

Group - D

6. (a) Write the mode of action of ascorbic acid as antioxidant. [(CO4) (Describe/LOCQ)]
(b) Name any two important enzymes from plant source and write their mode of action. [(CO5) (Understand/IOCQ)]
5 + (2 + 5) = 12

7. (a) What are phytochemicals? Write their mode of action. [(CO5) (Remember/LOCQ)]
(b) Write any two techniques for developing herbicide resistant plant. [(CO5) (Understand/IOCQ)]
(3 + 3) + 6 = 12

Group - E

8. (a) Write difference between organogenesis and embryogenesis. [(CO1) (Understand/IOCQ)]
   (b) Briefly describe the major applications of somatic cell hybridization. [(CO1) (Understand/IOCQ)]
   (c) Mention briefly the steps of micropropagation. [(CO1) (Analyse/IOCQ)]
   4 + 4 + 4 = 12

9. (a) Define biofertiliser. Explain the reason of preference of it over chemical fertilizer. [(CO3)(Knowledge/LOCQ)]
   (b) Mention two organisms which are used as biofertilizer. Write names of beneficiary crops. [(CO3)(Remember/LOCQ)]
   (c) Which alga are used as medicine and food- mention with example with respect to: Different potential products like antioxidant, antiviral, anticancer and anti-inflammatory products. [(CO3)(Explain/IOCQ)]
   (2 + 2) + (2 + 2) + 4 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	35.41	53.12	11.45

Course Outcomes (CO):

At the end of the course the student will be able to:

1. Explain the different techniques of plant tissue culture for bio-resource production.
2. Impart knowledge on all recent biotechnological developments related to the quality improvement of crops.
3. Understand role of plant along with microorganisms in agro-industry.
4. Analyze the role different molecular markers for different characters related to agronomic importance.
5. Understand the role of plants as bioresources by virtue of their secondary metabolites.

*LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question; HOCQ: Higher Order Cognitive Question